THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXV. No. 2132.] LONDON, MARCH 22, 1904. [56TH YEAR. PRICE 6d.

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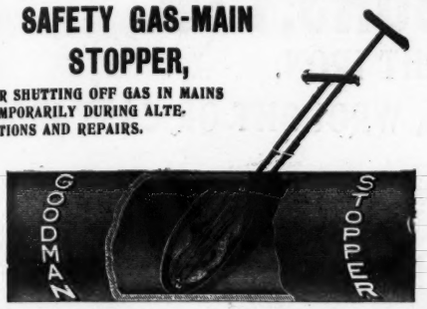

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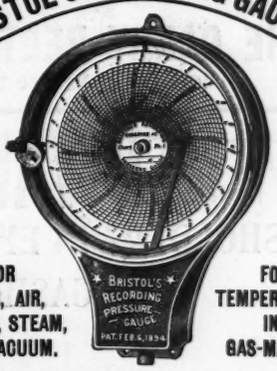

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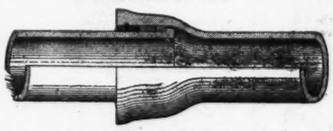

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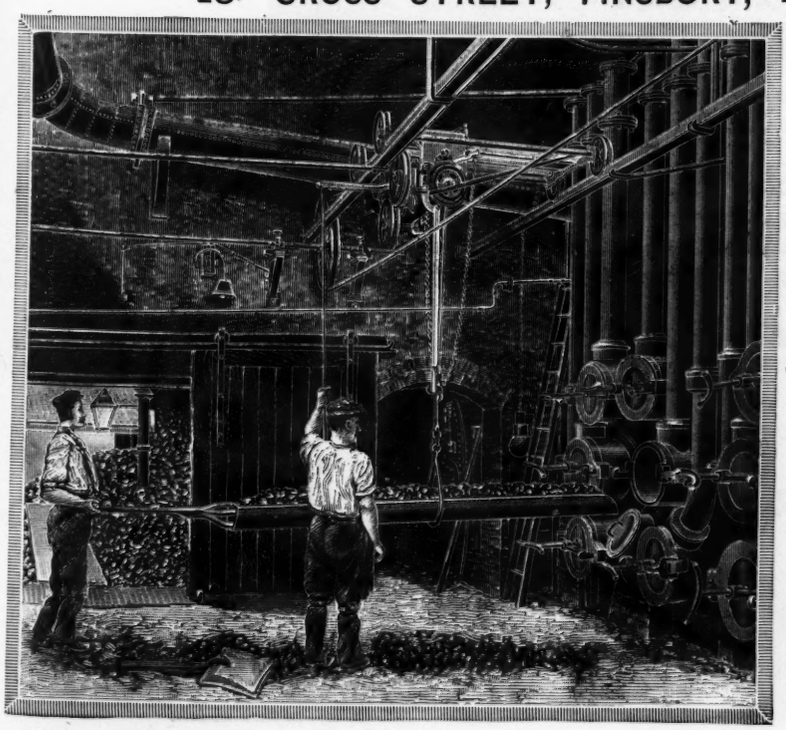

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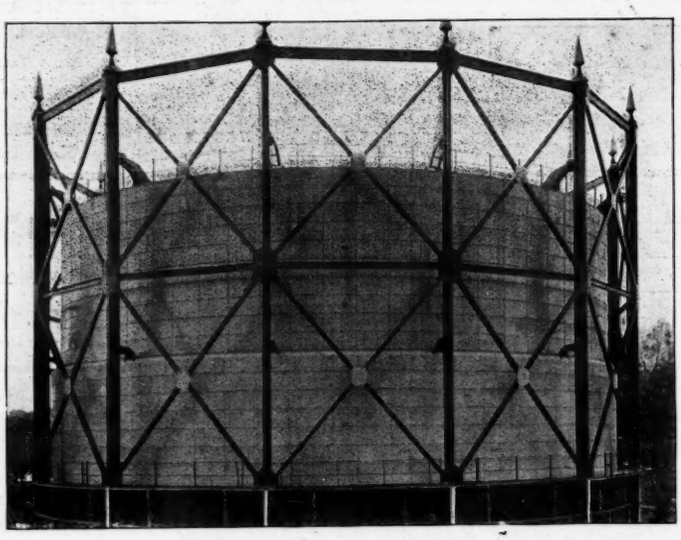

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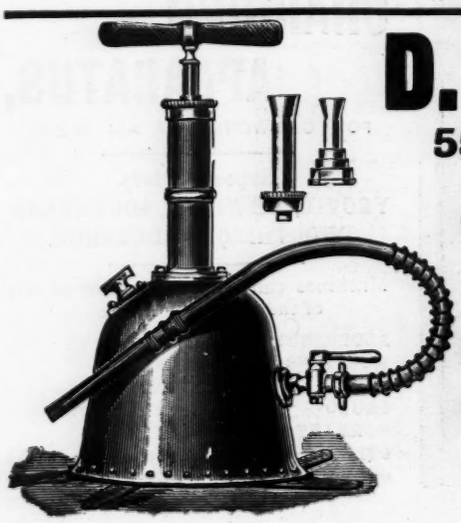

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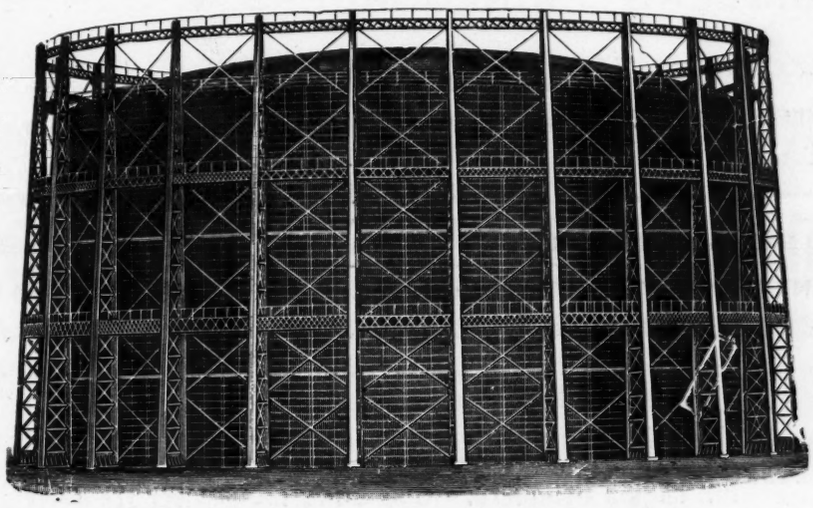

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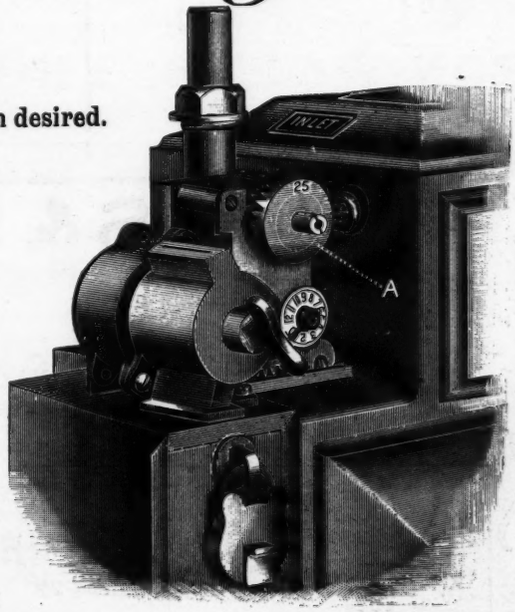

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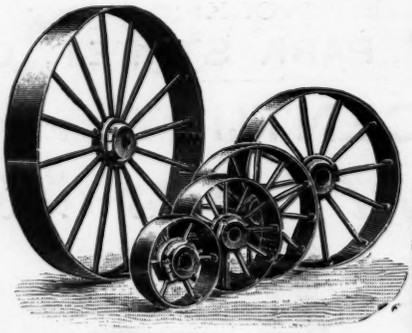

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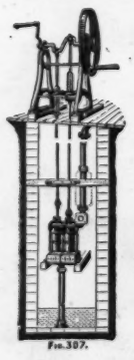
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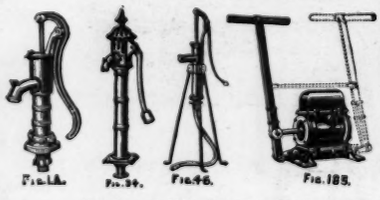

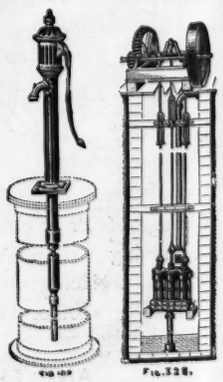

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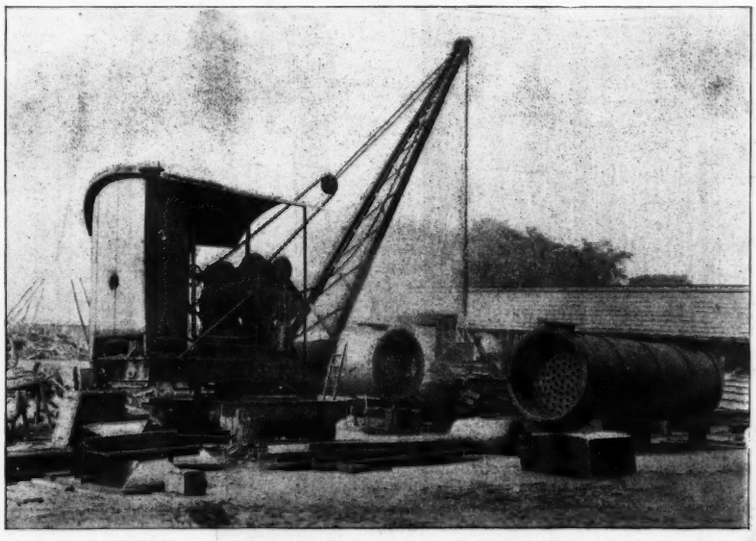

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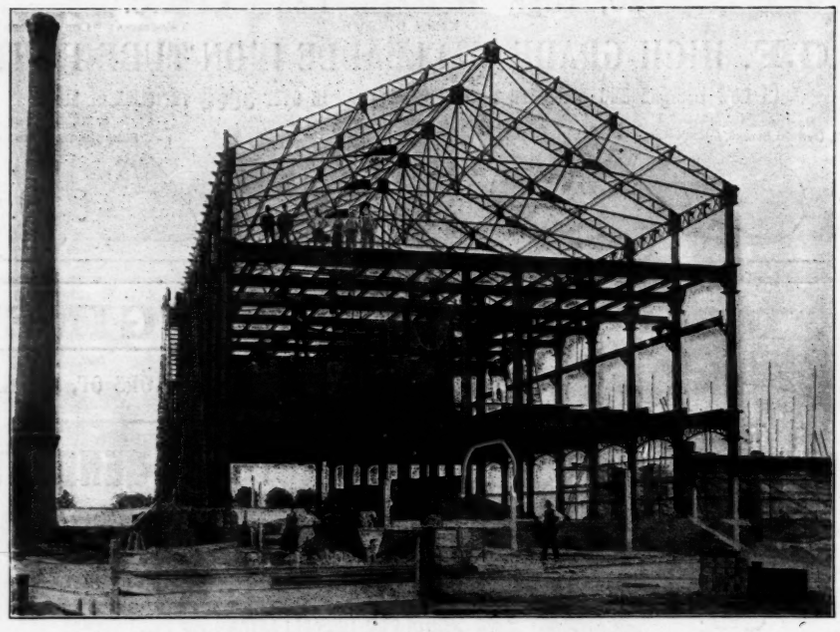

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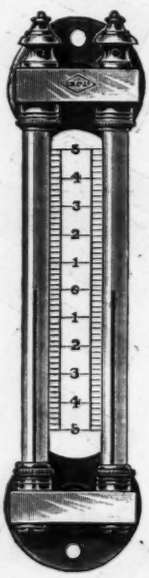

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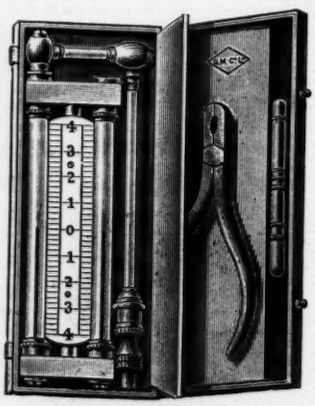

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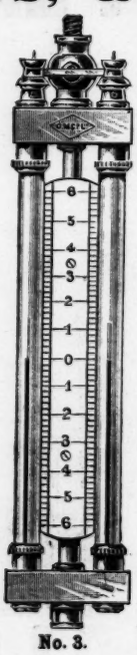

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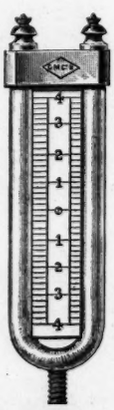

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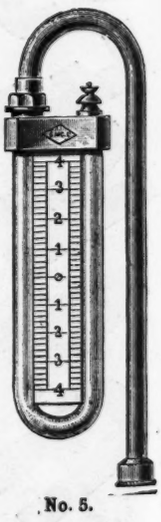

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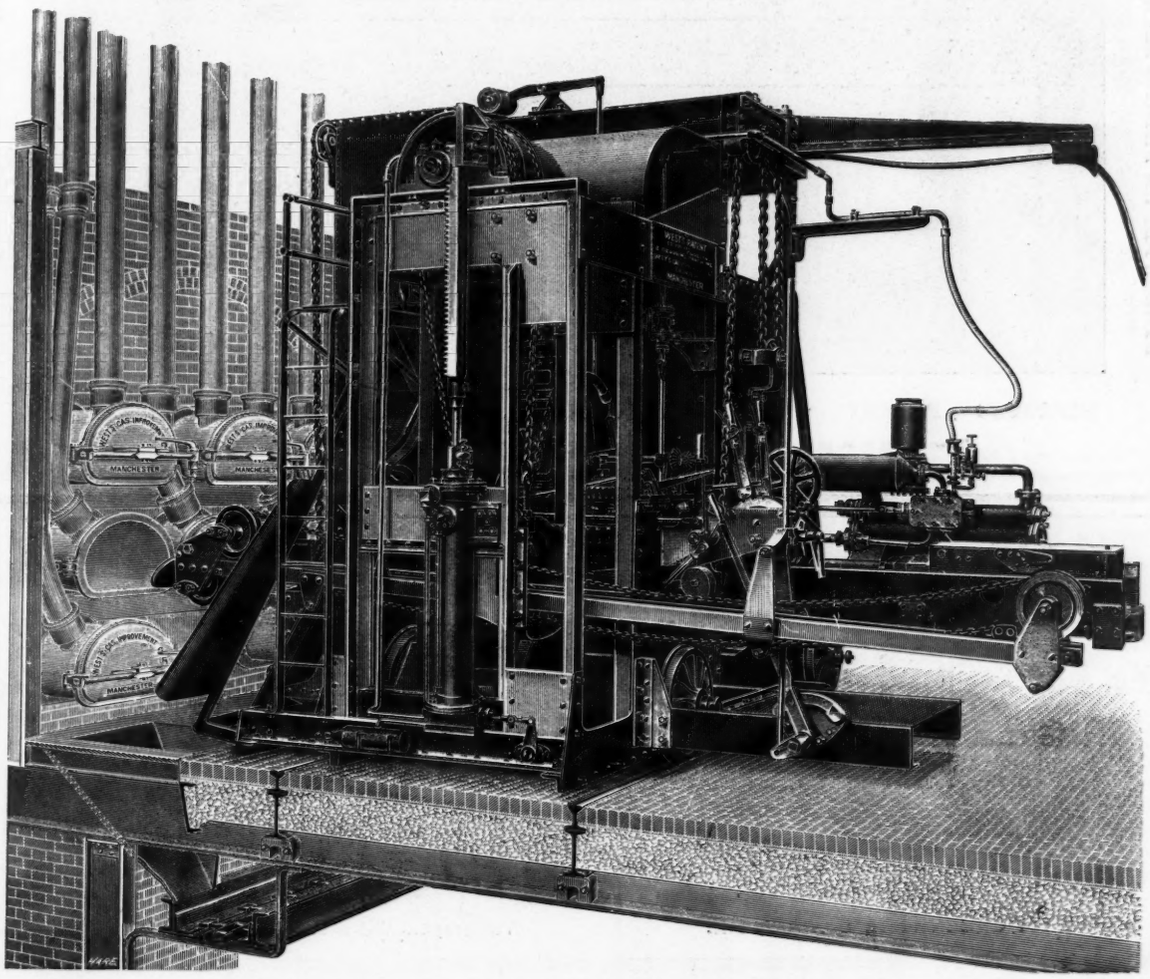

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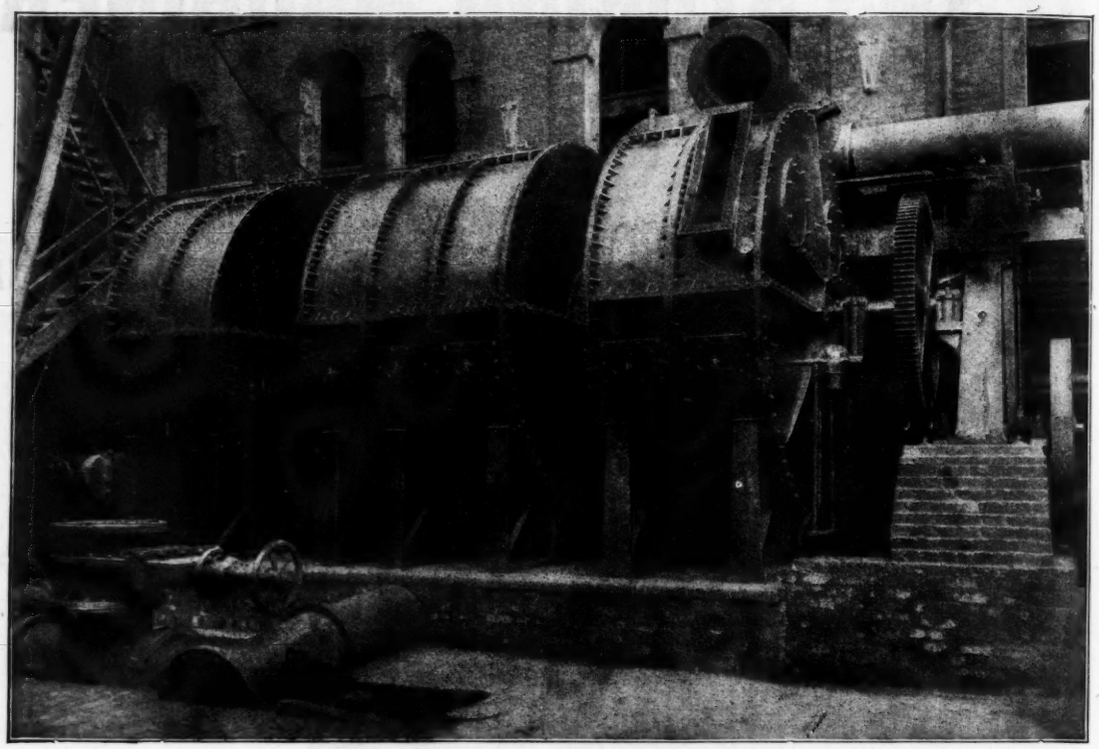

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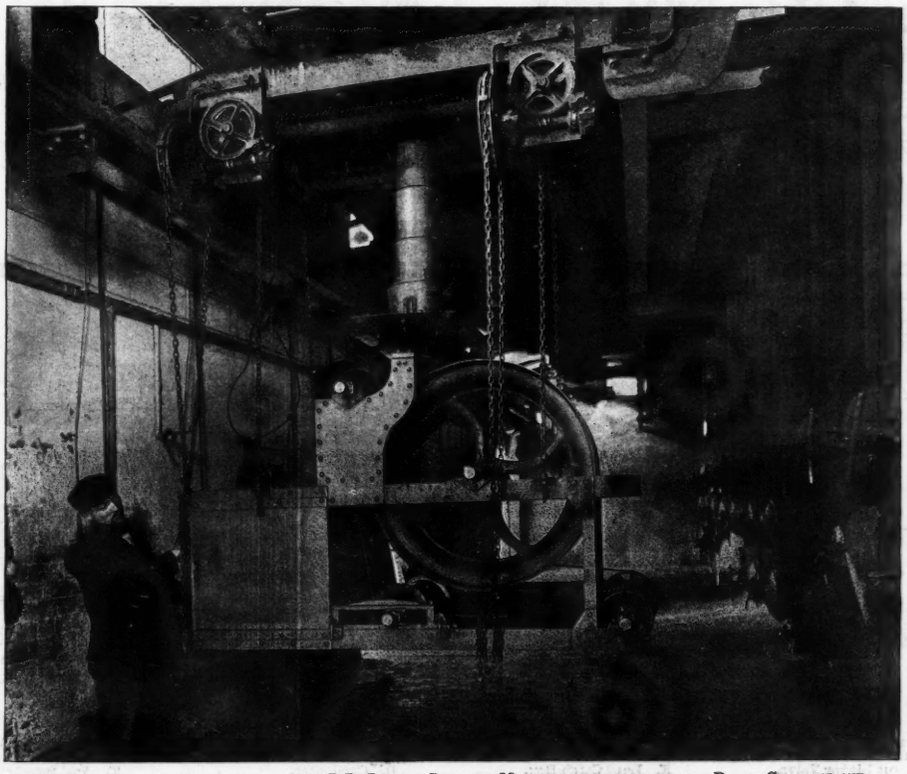

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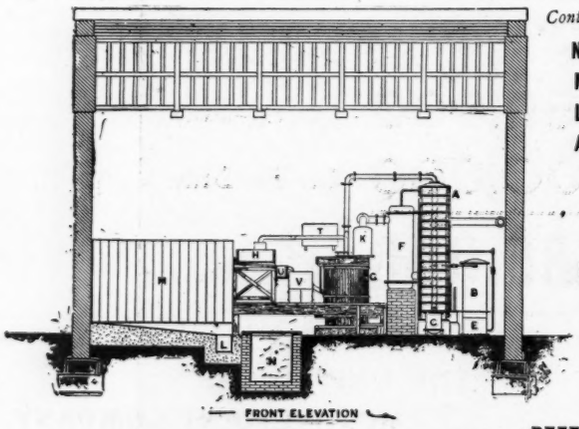

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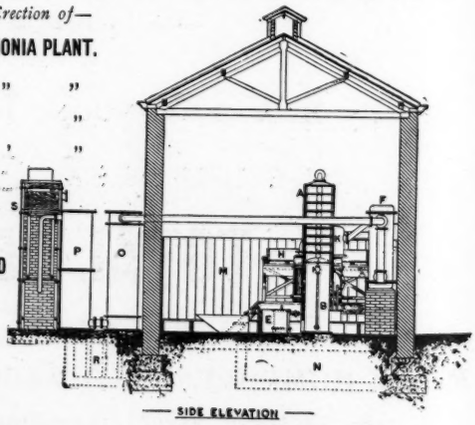

SIDE ELEVATION

REFERENCES.

A. Large Still (Ammonia).
B. Small Still (Lime).
C. Spent Liquor Valve.
E. Limeing Arrangement.
F. Heater.
G. Saturator.
H. Draining Table.
K. Lead Catch Box.
L. Mother Liquor Well.
M. Sulphate Store.
N. Acid Store Tank.
O. Condenser.
P. Scrubber.
R. Settling Tank.
S. Neutralization Plant.
T. Acid Supply Tank.
U. Mother Liquor Trough.
V. Mother Liquor Receiver.

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Wilton's Patent Neutralizing Apparatus for the Waste Gases from Sulphate of Ammonia Plant.

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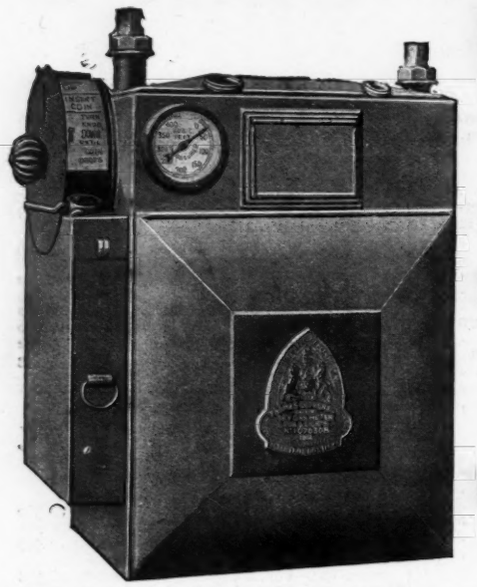

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EDITORIAL NOTES—GAS, &c.

The Southern District Meeting—Interesting Topics.

THE meeting of the Southern District Association last Thursday was very well attended; and the proceedings were exceptionally interesting. The new President, Mr. Douglas Helps, of Reading, delivered a well-considered and skilfully-composed address, which approves him once for all as deserving of the rise in his profession which it has been his good fortune to experience during the past few years. We are quite sure that the Directors of the Reading Gas Company will not be the least appreciative readers of the address, as given in another part of the "JOURNAL." There is that in this peculiarly personal manifesto of the President of the Southern District Association, which offers assurance that the gas affairs of Reading are quite safe in his hands. And the style of the address is as good as the matter; which it is always pleasant to be able to say. Doubtless, after Mr. Helps has had sufficient time to feel at home with the local conditions, he will be able to write a story of more accomplishment. There is plenty to be done. Not that Reading has been neglected hitherto, in a technical sense; far from it. But it happens to be peculiarly situated as one of the first towns out of London to have a life of its own, and to be outside Metropolitan Suburban life. It will therefore be interesting to mark how the young growth of the gas industry which is such a feature of the times, will make itself felt in the town.

A deep note of personal interest pervaded the meeting, on account of its being the occasion for the reappearance in public life of Mr. James W. Helps, the Honorary Secretary, after his enforced absence from the post of duty. There ought to be a proper word in the English language for the travel-in-search-of-health, which seems to be an increasing necessity for the preservation in efficiency of overstrained workers. Mr. Helps is a worker in respect to whom the common saying that he "never spares himself" is a quite inadequate expression of the truth. Rather, it appears that he labours at everything he takes in hand as though he could never take enough out of himself; and it is always in the service of others that he works his hardest. There could be no mistaking, at the meeting, the depth and fervour of the feeling with which the members of the Association greeted Mr. Helps once more, on his restoration to health. How completely he is his old self again was demonstrated by his nervous, telling delivery of a couple of "rattling" speeches on the question of the affiliation of the Association with the Institution of Gas Engineers. After the remarks of Mr. Helps, and the speech by Mr. H. E. Jones, the President of the Institution, it was the general impression that the case for the movement in question had been notably advanced in the direction of an affirmative answer.

It is to be regretted that the merits of this proposal of Mr. Andrew Dougall, the Past-President of the Institution, for a rallying of the, at present, independent forces of this body and of the local technical organizations—called, for the sake of convenience, "District Associations"—under one common headship, should have become obscured, as there is reason to believe has happened, by verbal forms and constitutional formalities. Mr. Jones and Mr. Helps did good service on Thursday in brushing aside all this source of misunderstanding, which ought not for a moment to hinder the progress of fraternity in the minds of sensible men; and setting in the clearest light exactly what is the intention of the promoters of the movement. First and last, what is meant by this word "affiliation," in this connection, is no more nor less than a compact by virtue of which all duly qualified members of any recognized Gas Engineers' Society in the United Kingdom shall be admissible to membership of the Institution without payment of the usual entrance fee. Certain administrative arrangements would naturally ensue upon the conclusion of such a compact, such as the *ex officio* membership of the Council of the Institution for the time being of the Presidents of the other Societies. But these are matters of detail that would not offer any real obstacle to the completion of such an arrangement. Obstacles which appear to have been perceived—such as fear lest any of the contracting parties might lose individuality, the continuity of their corporate existence and name, or be placed in any difficulty by reason of lack of conformity between their rules and those of the Institution—have no reality. There is nothing of the sort in the programme. There is no suggestion that all the members of every old and famous society, whether qualified or not for membership of the Institution under the rules of the latter, should be implicated in the formal compact, by whatsoever name it may be called. The use that is contemplated for this fraternal bond will remain strictly individual. The initiative will rest with every society member personally. Seeing that all gas engineers and managers are already brothers in the spirit, and that there is no strangeness between them whenever or wherever they foregather—that there is no difference of heart between North and South, or East and West—it is scarcely too much to hope that, with time, the members of the profession will find themselves all owning allegiance to one representative body, without severing their local ties.

It is desirable above all things, at the present stage of the negotiations, to avoid the unnecessary employment in debate of such question-begging appellations as "parent" or even "district" society. There is no parent society, as a matter of fact; and associations that are truly national reasonably resent being classified as "district" organizations. Moreover, all our British technical societies have their peculiar characteristics, on which they properly pride themselves—one is the oldest, one the largest, and so forth. But there are no members of any one of these worshipful companies of followers of a common calling who do not know that they would be individually welcome in any other. There are none who would not stretch out the right hand of fellowship to any brother of the cloth who might come among them. Then why should there be any collective aloofness, where there is nothing but individual amity and brotherly feeling? Surely, mere organization does not so change the hearts and minds of men as to cause them to deny as a body what they gladly yield as men—namely, mutual aid, countenance, and support in the pursuit of the common object. Besides, if it were necessary—as it must not be supposed to be—to base a disposition of the spirit and the heart upon the lower ground of practical advantage, it were easy to argue that a policy of exclusiveness is singularly unprofitable for the followers of a calling in which ambitious men can hope for a wide scope for their abilities. It is true that members of non-affiliated technical societies, if eligible, will continue free to join a Central Association; but it will be better for everybody and everything concerned that the union be as complete as possible. Let us hope that this reflection will spread and deepen with time.

Another topic which lent interest to the meeting was the interim report of the Committee on Naphthalene. It must be stated at once that the work of the Committee, which was not begun till last May, has only proceeded so far as to enable Dr. Colman, the investigator appointed to carry out the observations and experiments required to track the bugbear to its lair, to perceive some promising indications. More money is needed to conduct the inquiry to a successful issue, if this is the fortune reserved for the Committee and their adviser; and we gladly support the appeal for financial assistance. The results of the investigation, whatever they may be, will be published to the world. The object is the clearing up of a mystery that has hitherto baffled all the science and practical skill enlisted in the service of the gas industry, and the consequent removal of an obstacle to the reliable and constant supply of gas which is of great annoyance to all concerned. Dr. Colman is going about his work with the resources of a chemist, but also in the spirit of a gas manager. That is to say, the mere phenomena of the occurrence of naphthalene and its deposition in gas mains and apparatus are subordinated to the aim of capturing the obstruction in the condensers, where it can do no harm. It is to be hoped that the industry will not exhibit the humiliating spectacle of a promising inquiry stayed midway for want of

funds. If this should happen, no gas manager will ever be able to talk about naphthalene again. In truth, mere chatter about its troubles and perplexities is perfectly idle; and the members of the Association showed their sense of this on Thursday by refraining from yielding to the temptation to indulge in it—contenting themselves with offering hints for the future conduct of the inquiry.

Manchester Retort-House Practice and Working.

LETTERS have been received on the subject of Mr. J. G. Newbigging's paper at the February meeting of the Manchester Institution of Gas Engineers, in which paper he gave, among other features, what are generally agreed as remarkable figures, which do not at all accord with general experience and practice in respect of labour in retort-house working. As we have said before, there is no desire to have the contents of the paper generally discussed in these columns at present. Until such time as the debate is concluded at a meeting of the Manchester Institution, and Mr. Newbigging has answered his critics, it must be held that both the Institution and Mr. Newbigging have certain rights which must be respected.

From the correspondence, however, there appears to be some apprehension of the danger that hasty readers and directors and committeemen may perhaps regard the figures as to labour and costs (more especially in connection with machine-operated horizontal retorts) as being representative—to the detriment of that system of working. But those who thoroughly read the paper and the discussion so far as it has gone are not likely to fall into any such egregious error. There are explanations to be made as to the cause of the figures for labour in Manchester being so far beyond what is customary; and when they are made, we have a notion that it will be found that the responsibility will, with common consent, be shifted from the shoulders of the Engineer and find a fit resting-place among what we believe are, so far as he is concerned, unusually despotic labour circumstances. That there is an extravagant number of men engaged on machine work in the Manchester horizontal retort houses cannot be denied. Proof is found everywhere. It has already been given, at the Manchester Institution meeting, by both Mr. J. C. Belton and Mr. Tim. Duxbury; and, in one of the letters addressed to the "JOURNAL" on the subject by a Gas Engineer, additional evidence is advanced, in connection with a house which is more comparable on all points than the examples quoted by the two critics named. For this reason, the figures may here be given. The house in question contains 25 beds of nine retorts, and in the twenty-four hours, with six-hour charges (7½ cwt.), 337½ tons of coal are carbonized. The men employed in this house for three shifts of eight hours are as follows: 1½ foremen (one foreman on each shift for two houses), 12 firemen, 12 machine men, 18 machine attendants, 3 chippers, 2 patchers, 15 stackmen, 1 sweeper and oiler, 1 compressed-air engine man, and 3 engine and breaker men. The men number 68½ for the 337½ tons of coal. The figures are actual ones from an important works; and they should be compared with those in the first table on p. 555 of the "JOURNAL" for March 1. Then it will be seen that, on this basis, the 378 tons of coal carbonized in the Gaythorn house, using compressed-air machinery, should only require 76·72 men as against the 110 now employed. After this, those who have been afraid that Mr. Newbigging's figures will in themselves exert an unfavourable influence on machine-worked horizontal houses need do so no longer.

But, after all is said, is there nothing to be put forward in connection with Manchester of a favourable character? While Mr. Newbigging's labour figures cannot be accepted as representative of what is general throughout the country, there is a point that, so far as the discussion has proceeded, has been entirely overlooked. We do not presume to speak for Mr. Newbigging or the administration of Manchester in this matter; but the point is one which, in the interests of fair play, should be taken into the calculation. If the last issue of "Field's Analysis" is consulted, it will be found that, among the Corporation gas undertakings the working figures of which are analyzed, there are two whose makes of gas are in excess of that of Manchester; they are Birmingham and Glasgow. But it will be seen, under manufacturing charges, that while the wages at Manchester only average 2·47d. per 1000 cubic feet of gas, those at Birmingham average 2·65d., and at Glasgow 3·72d. Manchester, in fact, is the lowest in this respect in the list of the Corporation undertakings; while Oldham and Edinburgh are the highest—viz., 5·02d. and 6·28d. respectively. This is a point that is merely mentioned as a fact the existence of which might not be expected from the tabulated workings in Mr. Newbigging's paper; but we will not enter into any maze of assumption in search of an explanation. Clearly, however, if the labour bore the same relation to the coal carbonized as in the examples quoted in discussion and above, Manchester would hold a still more remarkable position among Corporation gas undertakings in regard to the cost of manufacturing wages per 1000 cubic feet of gas made. In calling attention to this matter, it is hoped that we have not trespassed on the material which Mr. Newbigging may have in reserve for his reply to the critics of Manchester working.

Gas Bills in Parliament—A Bad Precedent.

THE gas business transacted by Parliamentary Committees last week was of small amount; being confined to the Tynemouth and Matlock opposed Bills. As recorded in last week's "JOURNAL," the Tynemouth Company (a maximum-price Company) obtained a reduction of their statutory illuminating power from 16 to 14 candles. This was compensated for, in a way, by the reduction of the maximum price; but inasmuch as this would certainly have been reduced in any event, it is not clear at how much the Committee intended to appraise the two candles taken off. As a matter of fact, the consumers will have the whole benefit, whatever its amount. In this connection, however, it is impossible to avoid the reflection that the new clause accepted by the Company, forbidding any change to be made in the composition of the gas to be supplied henceforward, is very greatly to be regretted. The utmost liberty for the gas manufacturer has been understood to be one of the tenets of Sir G. Livesey, who was advising the Company; and it is difficult to reconcile one part of his evidence with the acceptance of a precedent which would appear to debar the Company from ever taking advantage of an improved system of manufacture which should alter, in however small a degree, the composition of the Company's gas. Unless we are mistaken, the Tynemouth Company are the only gas manufacturers in the United Kingdom subject to any such disability. It will certainly be the aim of advisers of other gas companies who will have to follow after, to prevent the precedent from spreading. The other experiences of the Tynemouth Company were less disappointing. They obtained all the additional capital they asked for, and will have to conform to the recommendations of the Board of Trade Committee as to testing. This, under the circumstances, is reasonable enough. The only regrettable feature of the settlement was the trammeling clause already mentioned. There is nothing novel to discuss in the Matlock and District Gas Bill. There was a question of severance and purchase, which was the chief motive of the opposition.

The Rating of Machinery and the Private Railway Sidings Bills.

ANOTHER attempt to nibble at the question of local taxation was made by the House of Commons on Friday, when the Rating of Machinery Bill was again read a second time, though by a reduced majority. The debate was marked by the usual flat contradictions as to what would happen if the Bill were passed; but it had the effect of extracting from Mr. Grant Lawson, speaking for the Government, a repeated assurance that they will deal with the whole question of rating, if they remain in power. Whenever this pledge is redeemed, it will be found that light as well as heavy machinery will be included. The question is of considerable importance for gas manufacturers, in view of the sweeping changes that have been introduced into gas-works during the past few years. Some twenty years ago, gas making by machinery was only tentatively practised in the very largest works, or where the engineer in charge had personal convictions on the subject. Now, as everybody knows, the condition is altogether different; and both fixed machinery and machine tools are in extensive and increasing use in all gas-works of sizes above the very smallest. On the same day, in the House of Commons, the Railways (Private Sidings) Bill was read a second time, and referred to the Standing Committee on Trade. This surely means that it will have a good chance of becoming law. The measure, which was in the hands of Sir John Brunner, extends

the "reasonable facilities" that railway companies are compelled to afford to traffic, under section 2 of the Railway and Canal Act, 1854, to the junction of private sidings with their lines. It also applies to the receiving, forwarding, and delivering of goods to and from these sidings. Sir W. Tomlinson, in supporting the Bill, remarked that it is the fruit of certain decisions of the Railway Commissioners, which go to show that owners of private sidings have no rights as against the railway companies. This state of things is not defended by the railway interest, which, by the agency of Sir F. Banbury, accepted the Bill, with reservation of power to settle before the Committee what is meant by "reasonable facilities." This spectacle of both traders and railway companies agreeing to the measure appears to have favourably impressed the President of the Board of Trade, who thereupon declared himself prepared to consider impartially any amendment submitted by either party. Gas companies in different parts of the country have had disappointments in regard to the usefulness of private sidings; and this is one of the subjects in regard to which they are probably in agreement with the colliery proprietors. Sir James Joicey is a supporter of the Bill; and it should be possible to hope that, with all this influential backing, the resulting Act will be found to remove all substantial grievances as to the use of these connecting-links between works and main lines.

The Triumph of Mr. Beasley, of the Taff Vale.

THE presentation to Mr. A. Beasley, the General Manager of the Taff Vale Railway, of a testimonial subscribed for by South Wales employers of labour, in recognition of his services in obtaining the celebrated Taff Vale decision as to the liability of Trade Unions for strike damages, signalizes the conclusion of a remarkable chapter in the national industrial history. It was largely due to Mr. Beasley's character, administrative skill, and determination that both employers and Trade Unions know to-day exactly how they stand before the law. The Taff Vale Railway case was one of those difficulties which, in the hands of a strong man, become opportunities. It arose, as Mr. Beasley has stated, quite differently from the theory of labour organization which is often asserted to be the reason for the existence of Trade Unions. The Taff Vale men were never asked whether or not they belonged to a Union; and there was not even a pretence that a Union was necessary to secure them proper treatment by their employers. But, in a time of peace, the Amalgamated Society of Railway Servants laid siege to the Company, and having secured in their membership 95 per cent. of the men, deemed in 1900 that their hour was come to try who was master. Everything, apparently, was in favour of the attack. The coal trade, on which the Company mainly depend, was prosperous; and the agitators counted upon the colliery proprietors to put pressure on the management to yield everything rather than stop running. A plausible case of alleged tyranny was vamped up; and the wirepullers of the strike fondly imagined they would crush and humiliate the Manager. How things turned out is now history. The local traders showed every consideration to the Railway Company. The strikers were dispensed with, and their places filled up. The new hands were efficiently protected from violence; and though there were cases of outrage during the few days that the strike lasted, the game of mob tyranny was quickly perceived to be a losing one. Then there came the retribution; and the Amalgamated Society of Railway Servants had to pay the Taff Vale Company £23,000 for their folly. The exhibition by Mr. Beasley of a photograph of the Society's cheque for this sum was an incident of the recent function. Though the Trade Union leaders and some of their political sycophants profess to hope that the Legislature will make an alteration in the law in their favour, so that Union funds may not be liable for damages caused by illegal acts, it is pretty safe to hold that Mr. Beasley's victory was the decisive close of the New Union campaign.

The Prepayment Meter Clauses.

In dealing with the subject of prepayment meter clauses in the last issue of the "JOURNAL," the view was expressed that—providing there was a little more leniency in the matter of the percentage allowed to gas suppliers on prepayment meters where fittings were not furnished—the question of the insertion of the clauses in Gas Bills in the future, as is suggested, might be, generally speaking, regarded almost with indifference. And our opinion still is (while we have no desire to see them imposed) that their imposition would not work any particular hardship excepting perhaps in a few cases; and in this the majority of gas engineers would agree. Mr. H. E. Jones has pointed out that in rural districts a fixed charge of 10d. above the ordinary price would be unremunerative; the President of the Southern District Association (Mr. Douglas H. Helps) in his Inaugural Address asserts that there are cases in which it would not suffice to cover expenses; and Mr. H. Townsend, of Wakefield, in a letter elsewhere, says he scarcely finds 1s. 1d. remunerative. On the other hand, Mr. J. Ferguson Bell, of Derby, who is working under the clauses, does find the 10d. sufficient. The London Companies acquiesced in the 10d. in 1900, because it coincided with the extra rates they were then charging. The Matlock Company in their Bill (which was considered last week in Committee) only asked for the 10d. excess. In short, it would be found upon investigation that gas suppliers with an extra charge above 10d. on the ordinary price are the exception rather than the rule. We venture to think that, even if the Manchester Institution of Gas Engineers were canvassed, Mr. Townsend would find himself standing among the members almost alone with his 1s. 1d. But it is easy to shift from one's ground to the extent of saying that there may be rural districts and very poor neighbourhoods where the consumption of gas by the prepayment system would not give an adequate return to the suppliers with the tenpenny excess; and to meet such cases, if the clauses are insisted upon in future Bills, it might be, in fact it should be, placed within the power of Committees to hear evidence showing cause why a sum above the standard of 10d. should be allowed, and to grant it if satisfactory proof is given. This is a point that should be emphatically urged before the proper authorities at Westminster.

Extravagance All Round.

Municipal extravagance is shown in small things, no less than in great. Last week, the Plymouth Town Council had under consideration two matters in which the electric lighting undertaking was concerned. One was a proposal to add to their enormous burden of debt by borrowing £20,000 for additions to the plant at the electricity works; the other was a question of improving the lighting of a portion of the municipal buildings. The Electrical Engineer had been invited to report on the question of adopting the electric light in certain rooms of the building. He estimated the cost of wiring and fittings at £110; while he put the outlay on new gas-fittings at £68. Nothing seems to have been said as to the subsequent cost; but one of the councillors called attention to this estimate, and said that, as regarded the gas-fittings, it was grossly exaggerated, and that the Gas Company were prepared to put in incandescent lamps which would excellently light the place for £27 10s. A vote was taken on a motion to refer the question back to the Committee; and the result was the confirmation, by the casting vote of the Mayor, of the Committee's extravagant proposal. After this, the adoption of the report recommending the spending of the further huge sum on the electricity works was almost a matter of course. A small minority of the members raised their voice in protest against any addition to the debt at a time when the Corporation are seeking from Parliament relief from their financial difficulties; but the protest was of little avail. A member of the Committee assured the Council that the expenditure would prove to be "not only remunerative, but extraordinarily so," and said he hoped they were "coming to a time when it would be all electricity and no gas." He was reminded that the Local Government Board had reported that they were £5000 behind on the sinking fund, and that the provision for depreciation was inadequate. This, however, made no difference. A section of the Council seem indeed to treat the financial difficulties of the town as a good joke, though these troubles are, and are still more likely to be, anything but a jest to the poor ratepayers who have to meet the increasing demands on their pockets. A suggestion that the money should not be spent until the proper sanction to its outlay was obtained, only raised a laugh; and so, by a vote of three to one, the proposal was carried. The incident is not perhaps of much importance to anyone outside Plymouth; but it curiously illustrates the tendency which some men who display keen business instincts in their own affairs seem to have to forget all business maxims and principles when they come to deal with public matters.

Where Indulgence Ends.

But however extravagant the Plymouth Municipality may show themselves to be in regard to matters of expenditure, their dealings with at least one of their customers do not seem to be characterized by a similar spirit of indulgence. As readers of the "JOURNAL" are aware, the Gas Company have recently spent some £1200 in building and fitting up first-rate mess-rooms, lavatories, shower-baths, &c., for their men; and as the Company take the whole of their water supply by meter from the Corporation, that used by the men in the new lavatories would, in the ordinary course of things, pass through the same meter, and be paid for accordingly. In the working-class districts of Plymouth, there are no cheap public baths, so that the men have hitherto washed themselves at home as well as they could with Corporation water, for which the landlord has to pay on the basis of rental. Therefore, of course, the Corporation, while still receiving the same amount of water-rate from the landlord, save the water which the men formerly used for washing at home, and would in the usual way receive payment for it again along with the Gas Company's trade supply, when it was consumed in their lavatories. This would seem to be sufficiently in the nature of "unearned increment" to satisfy any reasonable beings—without considering the fact that it is to the interest of the Corporation, as the Sanitary Authority, to encourage employers to look after the health of their men, and furnish the baths, &c., which it would otherwise be their own duty to provide. But, as already remarked, "business maxims and principles" in dealing with public matters do not seem to be strong points with the representatives of the Plymouth ratepayers; and hence it is not so surprising as might under other circumstances be the case to learn that the Council have, upon the recommendation of the Water Committee, decided that the water furnished to the lavatories on the gas-works shall be classed as a domestic supply, and charged for at the rate of 2½d. per 1000 gallons more than that used elsewhere by the Company. This brilliant financial stroke will, of course, add a little to the water revenue; but it will at the same time assuredly act as a deterrent to local employers of labour who otherwise might be inclined to follow the excellent example set by the Gas Company. Evidently the Corporation have more regard for their position as traders in water than they have for their duties as guardians of the health of the borough; for we cannot believe that, simply because the Gas Company are such powerful rivals to their pet electric light undertaking, different treatment is meted out to them from that which would be accorded to other commercial concerns under like circumstances. So far as the Gas Company are concerned, the result, put shortly, is that they are fined 2½d. per 1000 gallons of water used for having had the temerity to provide sanitary facilities for their men.

Gas again on Top.

Last week we gave some particulars regarding an interesting experiment in the lighting of a trolley-wire tramway route at Darlington by means of electricity and incandescent gas-lamps. An inspection of the lights has now been made by the Streets Committee, who have unanimously decided that incandescent gas-lamps shall be fixed on the trolley-pole standards throughout the entire tramway route, on account of their being cheaper as well as affording a superior method of lighting. The existence of both these advantages could hardly be doubted, bearing in mind the fact that the electric lamps would have been required in addition to the existing street lighting system, whereas the incandescent gas-burners, it was considered, would be sufficient to illuminate the thoroughfare as well. It should be pointed out that the majority of the members of the Tramway and Electricity Committee are also members of the Streets Committee, so that there can be no doubt of the experiment having been a perfectly fair competition between the two lights. Congratulations are therefore due to the Gas Engineer (Mr. F. P. Tarratt) on his success. A single trial of this kind may perhaps not be of very general importance; but each one goes to swell the amount of evidence available as to the superiority of incandescent gas for street lighting purposes. The day cannot be far distant when the accumulated testimony in this direction will be universally considered sufficient to render any further experiments altogether unnecessary. Readers of the "JOURNAL" have, of course, long since ceased to have any doubt about the matter.

The Question of Smoke.

A meeting of architects would not perhaps strike one as being the most likely occasion for a good discussion of the advantages of cooking and heating by gas; but the members of the Society of Architects who were present last week to hear Mr. T. G. Marsh read a paper on "Domestic Fires and their Relation to the Smoke Nuisance," proved themselves quite equal to the occasion. No higher compliment can be paid to the reader of a paper than to discuss it well; and on this head, Mr. Marsh had ample reason to be gratified. Of course, the speakers did not confine themselves solely to the subject of gas-stoves, though our report is necessarily limited to this portion of the proceedings. Some specially interesting remarks were made by a gentleman who represented the Coal Smoke Abatement Society, and who gave it as his emphatic opinion that the general use of gas for cooking and heating was the only possible solution of the existing difficulty with regard to the atmosphere of our towns. He had nothing but good things to say of gas fires and cookers, and was able effectually to dismiss some of the old, old objections to them trotted out by other speakers. One of the principal points urged against the adoption of these appliances for heating sitting-rooms, was that men and women "liked to poke the fire." But even if this were so, it hardly seems to be a sufficient reason for the retention of the coal-grate. In any case, however, we would respectfully suggest that a very efficient substitute might be found in grumbling at the gas supply. This would form an equally harmless outlet for angry feelings; and at the same time it would possess the advantage of calling for less exertion.

Public Authorities and Liability for Personal Injuries.

A decision was given by Mr. Justice Channell, in the King's Bench Division of the High Court of Justice, a short time ago which has brought out well another feature of municipal trading. During the electrification of one of the tramway lines of the London County Council, a collision occurred by which a man was injured, and he brought an action against the Council for compensation. Owing to illness, however, he did not do so until the six months from the date of the accident, which is the limit of time allowed under the Public Authorities Protection Act, had elapsed. The Council claimed to be exonerated from liability, under the Act named, because they were a statutory authority. The complaint against them was that of negligence in working their trams; and, in the course of his judgment, his Lordship said that if the matter had been open to him, he would have been inclined to say that the defendants would have been protected from the consequences of negligence in the course of the construction of the tramways, but not from the consequences of their servants' negligence in carrying on the work after the completion of the lines. In dealing with the matter, however, he had no discretion, as the case was governed by the authorities. He therefore decided that plaintiff, having allowed the specified time to elapse, was barred from obtaining damages at law; though it appears that the Council are prepared to deal generously with him privately. Had the accident occurred on a tramway in the hands of a private company, the applicant would not have been barred by the time-limit; and it does not seem altogether fair that a public body who have become traders should be accorded exceptional privileges in the matter of liability for accidents incidental to their operations, except as a preventive of blackmailing.

WATER AFFAIRS.

Engineers and the Local Government Board.

IN view of their generally over-cautious attitude towards new systems of construction, some surprise was manifested at the last meeting of the Society of Engineers (*ante*, p. 697) at the fact that the Local Government Board had sanctioned a loan for the building of a service reservoir at Penzance on the Hennebique ferro-concrete principle. Mr. Frank Latham, who described the work in the course of a paper on the Penzance Water Supply, stated that this was the first reservoir designed on the Hennebique principle to be passed by the Board, and that the loan had been granted for the full term of years. Naturally, the Inspector who

held the inquiry went very carefully into all the details—working out the strains, &c. This is as it should be. The sanctioning of the scheme, however, is satisfactory from an engineering point of view; for it shows that the Board—whatever they may have been in the past—are now more amenable to reason than they are usually given credit for being. This fact deserves to be noted, inasmuch as the fear that if a loan is requested for work on a new principle it will only be granted (if at all) for a very short period, must prove an obstacle in the path of improvement. Whether the particular system adopted at Penzance is the most suitable for such a purpose, is, of course, quite another matter, and one that must be decided according to the circumstances of individual cases. Mr. Latham seems perfectly satisfied with his reservoir, though it is greatly to be regretted that he did not at the meeting go into the question of comparative cost. All other things being equal, this is the point that must decide whether similar reservoirs are to be built elsewhere. Hence it is of the greatest importance for engineers to be able to compare the cost with that of other materials. We would suggest, therefore, that Mr. Latham should supplement his paper by an article in the "JOURNAL" giving some information on this head.

The Relationship of Woods to Water Supplies.

THE subject of the relationship of woods to domestic water supplies, which has for more than twenty years occupied much attention at forest experimental stations, especially in France, Germany, Austria, and Switzerland, is receiving consideration in this country in connection with the increased interest which is being taken in forestry. We have on several previous occasions alluded to the efforts that are being made to utilize watershed areas by planting them with trees; and the beneficial effects which would result therefrom are emphasized in a leaflet issued by the Board of Agriculture. It is not claimed that such tree-planting as is practically possible in Great Britain can have any appreciable influence upon the rainfall; in fact, the Board acknowledge that the foliage, branches, and stems of the trees intercept much of the rain and snow, so that it never reaches the ground. At the same time, the moisture in the soil is much better conserved in wooded than in the open country; and observations carried on over a long period have shown that more water drains from a planted area than from one devoid of trees. This arises, in the first place, from the fact that the roots of the trees offer mechanical resistance to the rapid surface flow of the water; and, secondly, when they die they leave holes through which water readily penetrates. The friable condition of the soil of a wood greatly facilitates the percolation of water, whereas the denser ground of the open country hinders it. The consequence is that streams in wooded districts have a more equable flow throughout the year than those which are more exposed. This is an important matter where the supply of water for domestic or industrial purposes is concerned; the avoidance of violent freshets on the one hand and scanty flow on the other being alike desirable. As was remarked in the "JOURNAL" last week, a large quantity of flood water is lost owing to the incapacity of the existing reservoirs to contain it. This matter is emphasized by the Board, who point out that though this water carries mud and other matter in suspension into the reservoirs, if these are surrounded by a well-stocked woodland the water in them is not subjected to the same amount of violent agitation during gales as is the case when this sheltering agency is absent. The deposit on the bottom, and especially along the margin, is consequently left comparatively undisturbed, with a corresponding advantage in the matter of purity. The Board urge that, by impeding the flow of the water which reaches the soil as rain, and by preventing evaporation, a catchment area covered with trees is equivalent in general effect to an increase in reservoir capacity. If the results obtained at the experimental stations support this contention, the afforestation question is one in which water engineers should be specially interested.

By pushing the decomposition of tar oils to the extreme limit, Professor A. P. Lidoff has succeeded, according to the "Journal du Pétrole," in obtaining a hard coke of superior quality. Thus treated, the raw petroleum of Grosny gives 5 per cent. of gas and loss, 85 per cent. of liquid hydrocarbons of different sorts, and 10 to 11 per cent. of solid hard coke. Of course, a determined temperature is necessary; and this the Professor puts at from 400° to 420°C. Reckoning the price of the petroleum at 6 roubles per 100 poods, products of the value of 10·50 roubles are obtained.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 787.)

IT is pleasant to be able to record an improvement in the general position of things on the Stock Exchange. Though there was never anything like real activity, still business was on the increase, and the tone steadily improved. This was due mainly to the cheapness of money, and in a greater degree to an abatement of alarm lest the conflagration in the Far East might extend and involve other Powers. So, what with a moderate amount of investment business, and with "bears" buying back, a fair advance in price prevailed until the inevitable realization of profits checked it. The close, however, was even then much better than the opening, and the tendency was firm. In the Money Market, the tendency was all towards increased ease; but rates steadied somewhat before the finish. Business in the Gas market was very fairly active; and it was not so much confined to dealings in one issue as it has frequently been. The tendency, too, was bright and buoyant; and several issues had a moderate advance. It may, however, be noted that the improvements were all in the London Market, and that there were movements the other way in the Provinces. But it must be remembered that the best of the Provincial stocks have for some time past been standing at very high prices compared with other gas undertakings. In Gaslight and Coke issues, business was brisk almost every day; and the persistent firmness at last produced a rise of a point in the quotation. The lowest price marked was 87 on the opening day; but on Tuesday 88¼ was touched, and several subsequent bargains were done at this figure. The maximum was firmer, and rose a point; and the preference had a similar gain, but it did not look any stronger. South Metropolitan was very active at first; but it quieted down before the close. Prices were good generally, and 118 was touched once. There were dealings in Commercial, all at nearly top price, and quite good enough to warrant an advanced quotation. Business in the Suburban and Provincial group was rather more active, with a rising tendency; British and Alliance and Dublin both scoring advances. But locally, Liverpool "A" had a fall, and Newcastle debenture was fractionally lower. The Continental Companies were quiet, but firmer. Union touched 105 once, and Imperial recovered a point. Among the remoter undertakings, River Plate advanced. In the Water Companies, business was fairly active on the whole—on some days much more so than on others; and the tendency was buoyant. Several issues had very moderate advances of a point or two.

The daily operations were: Gas business on Monday was moderate—mostly in South Metropolitan, and prices were unchanged. Tuesday was rather more active; and the rise began with an advance of 1 in Gaslight ordinary, and ¼ each in River Plate and Tuscan. Wednesday's business was about the same; prices being steady and unchanged. On Thursday, some of the best prices of the week were marked. Gaslight maximum and preference rose 1 each. In Water, Grand Junction, Lambeth, and Southwark rose 1 each, and ditto preference 2. Friday was firm and active, and Alliance old and British rose ½ each. Saturday was quiet and unchanged.

ELECTRIC LIGHTING MEMORANDA.

The Depreciation of the Metropolitan Electricity Supply Undertakings—The Affairs of the County of London Company—Charges for Electricity at Cheltenham—No Gas-Engines for Electric Power-in-Bulk Stations.

THE state of affairs resulting from the entanglement of the Marylebone Borough Council with the Metropolitan Electric Supply Company has been specially dealt with in another column. It is mentioned here only for the sake of emphasizing the fact, admitted for the first time on all sides, that the process of municipalizing the local portion of the electricity-supply undertaking must result in loss, which will have to be made good out of the rates. The great importance of this truth needs to be fully appreciated by the ratepaying public everywhere; because municipalization at a dead-loss is something that has never before entered within the scope of practical local politics. All sorts of consequences must flow from this financial condition, among others the indefinite postponement of any adequate provision for depreciation. It is scarcely understood so generally as should be the case, that even the most flourishing electric lighting companies doing business in the Metropolis are not all sound in this regard. An investor in electricity undertakings has been writing to the "Pall Mall Gazette" to point out that only six of the London Companies (named by him) practise a sound depreciation policy. We have looked up the particulars, and find that the percentages to capital spent of the depreciation allowances of these concerns, range from 1·84, which is the lowest, to 6·35 at the top. There is a question as to whether the Metropolitan Company ought to be included in the list; because the amount actually set aside by this Company for depreciation is low. Having regard, however, to the premium due to the Company under the Marylebone arbitration award, and the money to be paid for the Sardinia Street station, the Company are well off in this respect. But if 2½ per cent. is to be accepted as the minimum proper allowance for

depreciation—and, to do them justice, the boards of directors of all companies give effect to this rule as soon as they are in possession of the money with which to do it—then the electricity-supply committees of local authorities must stand condemned as wilfully courting insolvency.

It is, of course, understood that municipal suppliers of electricity would not have done so well as they have, if they had not had the advantage of the example of the companies to guide them. Naturally, the municipalities have no love for those whose business methods are, as a rule, so superior to their own. But the normal animosity between the municipal traders and companies in the same line of business rises to the virulence of rabies when the company in question happens to be one of the Brush family. Indeed, there is a self-styled municipal periodical which would often be gravelled for lack of matter, if there were no concern of this category to vilify. Now, it so happens that the County of London and Brush Provincial Electric Lighting Company, of which Mr. J. B. Braithwaite is Chairman, is one of the best-managed undertakings of its order. It had need to be; for its business has to be carved out by competition with the cheapest gas in London at one end, and against the harassing attacks of trading Borough Councils at the other. This is, therefore, precisely the kind of Electric Lighting Company which is worth watching. Take, for example, the statement of the Chairman at the recent annual general meeting respecting capital expenditure. The outlay on mains continues to be heavy, as the districts of supply are not yet fully cabled up. The Board, however, are well aware of the danger of unlimited main extensions; and the Chairman said that before any are put in hand, the Board take care to secure customers who will yield a return of 20 per cent. gross on the outlay. If the absurd applauders of municipal methods in electricity supply at all hazards would insist on the observance of the same sound rule by local authorities, the finances of the latter would be vastly benefited.

Action is being taken by the Cheltenham Corporation for the revision of the charges made for the various uses of the electricity supplied by the Lighting Committee, on the basis of the suggestions of the Borough Electrical Engineer, Mr. H. Kilgour, whose able analysis of the working costs of the Corporation station has been noticed appreciatively here on previous occasions. It has been proposed by the Committee to the Town Council that the charge for public lighting be increased from 1·91d. to 3d. per unit; that notice be given to the light railway company at present taking current from the Committee that the price must be revised, the present figure of 1·9d. per unit being unremunerative; and that the charge to ordinary private consumers be increased from 5½d. to 6d. per unit up to the equivalent of 500 hours' use per annum of the maximum demand recorded by the demand indicator, and 2d. per unit afterwards. It appears that these proposals are in abeyance for the moment; but whether or not they are eventually adopted by the Corporation, in a lucid moment, is a point of local interest only. The value of the record consists in its corroboration of the truth which is being painfully discovered in many places besides Cheltenham, that it takes a good electricity-supply business to do public lighting at less than 3d. per unit, without losing heavily by it. And as to the addition of a traction load, to which, before it was so well understood, an undue value was attached by central station proprietors, the difficulty is that a lighting undertaking can hardly afford to sell current at the price a tramway or light railway can afford to pay. Such a station usually wants at least 2d. per unit, and would really need 2½d. for the branch to pay reasonably well; whereas it is a small and badly-off electric tramway that cannot generate its own current for less than one-half these prices. Traction support of an electric lighting station, therefore, is largely of a charitable or political character. It suits a tramway or a light railway company to buy current from the local authority at a higher cost than that at which they could supply themselves—for obvious reasons. The passenger pays, which is another example of the splendid advantages attaching to municipal trading. To pretend, however, as many local authorities do, that they can supply current for public lamps at such ridiculously low rates as are often quoted in competition with gas, is an imposture—like the rated efficiency of the lamps supplied.

Engineers can scarcely help noticing the remarkable way in which the Metropolis is being ringed about with large electricity generating stations, for the supply in bulk of railways, tramways, and the greater electric lighting companies. These huge factories—the Becktons and East Greenwiches of the electricity demands of London—are as important as any other establishments of the kind in the world. Prominent among them is the power-house which the Metropolitan Railway Company are building at Neasden for the service of their system, now in course of being converted to electrical driving. One reflection is irresistibly suggested by this, as well as by the other establishments of the kind, and that is that the large gas-engine, to work with producer gas, still delays its coming. For the Neasden power works, the Company's Consulting Engineer sought tenders for three types of prime movers. There was the reciprocating steam-engine, whether horizontal or vertical, slow or quick-moving; there was the steam-turbine; and there was the gas-engine. The British Westinghouse Company, who cannot be suspected of prejudice in the matter, secured the contract for steam-turbines—a modification, it is understood, of the Parsons turbine. These machines are to be in 5000-horse power units; and the guaranteed steam consumptions are given by the Contractors as 17 lbs. per kilowatt at full load, and 20¾ lbs. at half load. Manifestly, the large gas-engine, working with specially-made gas, cannot yet compete with steam for such a purpose. Probably the defect proceeds from the producer rather than from the engine. The engine works well with blast-furnace gas up to 10,000-horse power units, as reported; but the blast-furnace evidently beats the power-gas producer as a source for the working fluid. And since the Metropolitan Railway Company had no use for a blast-furnace at Neasden, the electric power they require is to be generated by steam-turbines.

PARLIAMENT AND THE BERMONDSEY CLAUSE.

The attention of gas companies and other unrepresented ratepayers should be directed to the brief but important debate which arose in the House of Commons last Tuesday, on Mr. D. Ford Goddard's motion to apply the Bermondsey clause to the Borough Council of Marylebone, in respect to their electric light undertaking, concerning which so much agitation has arisen. For the first time the principle of this provision, which is that municipal electric lighting shall be so priced from year to year as to make the revenue balance the expenditure—thus preventing the bringing of any charge upon the district rates—was made the subject of discussion in the House, and the result was disastrous to the idea of making it generally applicable. Mr. Bonar Law, for the Board of Trade, explained that, while the Department opposed the clause on principle, there are special reasons why the Marylebone Borough Council ought not to be subjected to the obligation; and several members, usually holding contrary views, having spoken against Mr. Goddard's motion, it was negatived without a division. The effect was also to deter Mr. Kimber from moving the similar resolution standing in his name with regard to Acton. Thus, by the force of circumstances, the misfortune of Marylebone has had the deplorable result of leaving untrammeled the commercial ambitions of municipal traders. Yet it is not in the least probable that this is precisely what the House of Commons wants. The defeat of Mr. Goddard's motion may mean many things; but it almost certainly does not mean that Parliament is disposed to accord a free hand to municipal traders in competition with ratepayers.

No fault can be ascribed to the statement of the case for the clause which Mr. Goddard laid before the House. He rested the need for the instruction on the proved tendency of local authorities to tax the majority of their ratepayers for the support of undertakings which are only made use of by a minority. It is an incontrovertible fact that, as he said, 75 per cent. of the ratepayers in Marylebone will never derive any benefit from the public service for which they will nevertheless have to pay. It is not to be believed that Parliament meant local authorities to so abuse the privileges that were conferred on them by the Electric Lighting Acts. But, notoriously, the circumstances of Marylebone are exceptional; and the attitude of the Board of Trade in the matter merely means that petitioners for the insertion of the Bermondsey clause in an Electric Lighting Order must be prepared to make good every case on the merits, and especially take it at the proper time. In the present instance, the Bill of the Marylebone Council is only a Money Bill, to enable the Council to carry out statutory duties already imposed upon them; and the intervention of Mr. Goddard was too late to have a fair chance of success. It should have been the care of the Metropolitan Borough members, at the proper time, to prevent the abuse of municipal trading. As it is, everything appears to have conspired to the disadvantage of the ratepayers of Marylebone, and they were denied help from Ipswich at the last.

The remarks of Mr. Bonar Law might almost be interpreted as meaning that, in the judgment of the Board of Trade, a gas company has no special right to be protected against rate-aided electricity supply by a local authority. In answer to this presumption, it may be stated that the origin of the Bermondsey clause contains a sufficient admission of an opposite meaning. It is a matter of history that the Bermondsey Borough Council offered the Gas Company specific exemption from liability to pay an electric lighting rate in aid. But this favour was declined; and the Company elected to stand in with, and act for, the general body of ratepayers. If they were to act for themselves, it is quite possible that they might get exemption from rating in support of a rival business, more easily than as units in the whole body of ratepayers. The contention that municipal traders should have as free a hand as a private company for the development of any business, is one that Mr. Fletcher Moulton, K.C., laid before the House in the course of the debate. It appeared to have considerable weight. The idea is, of course, that as a first necessity for the successful development of any supply business is to get a large connection together at the earliest possible moment, it would defeat this perfectly natural and proper object to insist upon the price being made remunerative from the start. Let us examine this point at a little greater length; for in it lies the real strength of the opposition to the Bermondsey clause, as a principle.

All private commercial enterprise is of the nature of a wager, as many philosophers have pointed out. A man, or a company of men, put up a certain amount of money on the chance of

realizing a certain estimate—as, for example, that a particular commodity which they propose to offer for sale in a chosen market will meet with such a demand at their price that the merchandise will be profitable. The unknown quantity here is the volume of the trade that can possibly be done at the price. If the expectations of the adventurers are fulfilled, the undertaking is a success; if not, it is a failure. Being private persons, it is nobody's affair but their own how skilfully they may have framed their estimates or laid their plans. They can, and often do, go without any return upon their venture for a considerable period of time, while the business is in course of development. They are not beholden to anybody—certainly not to the public at large—for financial assistance; and if, when they have shot their bolt, they discover by painful experience that they have missed the mark, they retire from the fruitless endeavour. Perhaps somebody else, noticing where they have blundered, makes another trial and succeeds. Where, now, is there any parallel between this liberty of the private adventurer to succeed—or to fail—and the protected trading municipality? It matters not to the municipal committee whether their estimates are well or badly framed. Those who are instrumental in promoting the adventure do not stand to lose in any eventuality. In the case of the supply of electric light, or the provision of an electric tramway, the municipal speculators can cut prices below those of their rivals the gas or the railway companies, and can afterwards tax these rivals with a proportion of the loss on the venture.

This is the point, and since it arises out of considerations of natural justice, it is not to be put aside by any statements of policy on the part of the Board of Trade, or for the sake of the short-sighted desires of the Municipal Corporations' Association. If it is Mr. Law's desire, and that of Mr. Moulton, that municipal trading should be as free as private adventure, let it be so, and be as independent of the rates. That is all that private traders ask. As ratepayers, moreover, they require that to the extent and for the objects with which a rating authority goes into trade, it should be deprived of its rating powers. A gas company, like an electric lighting company, cannot depend upon a rate-in-aid; and this recourse should, in fairness, be denied to a municipal competitor. There is a way of doing what is fair by an untried municipal venture, and that is, to allow for the payment of interest out of capital, and to charge a proportion of the working expenses to capital also. This is merely an anticipation of the goodwill. It is the sole method of placing municipal and private trading on an equality. Only, in the case of the former, this facility should have a time limitation. Call it five years. If, after the expiration of five years from the commencement of the supply, the Bermondsey clause were to come into operation, the claims of justice would be satisfied. We commend this proposition to the consideration of those whom it may concern; and especially to Mr. Goddard and Mr. Kimber, who should not be turned from a good cause by one rebuff.

It is not to be overlooked that the principle of the Bermondsey clause is not a matter of interest for gas companies alone. On the contrary, it concerns railway companies at least as much. As a matter of fact, it was invented, we believe, in 1898 for the protection of the North British and Caledonian Railway Companies against a tramway enterprise of the Corporation of Dundee. The precedents are given in the useful article on the law of the subject contributed to the "JOURNAL" for June 30 last (p. 963), by Mr. Vincent R. Balfour Browne. We are glad of the opportunity for calling attention again to this contribution, especially as the time that has elapsed since the author wrote has brought an increase of importance to his conclusion in favour of supplementing the Bermondsey clause "by another." In view of accomplished facts, what would be the nature of the clause that Mr. V. R. Balfour Browne would propose to this end? Again, in the course of his article, this writer mentioned incidentally that the statutory limitations on municipalities trading as carriers are of less importance than restrictions on the conduct of general electricity supply undertakings, inasmuch as electric tramways, which are in question in the power connection, are as profitable as municipal lighting is generally the reverse. At the present time, however, the suspicion is more than nascent that municipal electric tramways have already been overdone. Like electric lighting itself, this traction branch of the electrical industries only pays in the most favourable localities, which are not numerous. Away from the Metropolis and the principal centres of population in the country, the profitable character of electric tramways is highly problematical even now. Many local authorities have rushed into this further adventure partly for its own sake, and partly also to provide occupation for electricity-supply stations not profitable in other ways. How this will eventuate in a variety of districts remains to be seen; but there is great probability that in not a few places the gas companies and the railway companies will be called upon to subsidize both municipal electric lighting and tramways to an unlooked-for extent. The prospect is not a pleasing one; nor is it one which the Board of Trade is to be felicitated upon, for it is largely the fault of the Department in treating municipal electricity supply and traction schemes too benevolently.

Mr. Richard Clayton, J.P., the Chairman of the Cannon Iron Foundries, Limited, of Deepfields, has just been elected an Alderman of the Staffordshire County Council.

GAS-ENGINES FOR PUMPING.

THE advantages possessed by gas-engines over steam-operated plants for the purpose of pumping water have, as is well known, secured their adoption in connection with many public and private water supply systems in this country and abroad. Numerous instances were quoted by Mr. D. H. Irwin, in a paper which he presented last July to the British Association of Water-Works Engineers, of gas being so employed, with highly gratifying results; and the number of the "JOURNAL" in which this communication appeared also contained some particulars regarding a pumping-station at Pittsburg worked by means of natural gas. The usefulness of gas-engines in this respect is not, however, by any means confined to domestic and trade water supplies, for an installation on these lines has been put down for operating the high-pressure fire service at Philadelphia. There are no less than nine engines (seven of 300 brake-horse power and two of 125 horse power), all of the vertical, three cylinder, single-acting, four-stroke cycle Westinghouse pattern; and they are operated by ordinary illuminating gas of about 23-candle power, and a calorific value of some 675 British thermal units per cubic foot, which is drawn from a 24-inch trunk main connected with two of the largest holders in the city. In the course of a full and amply illustrated description of the installation which appears in "Cassier's Magazine," the writer, Mr. J. R. Bibbins, states that recent successful tests upon the completed system furnish the best evidence of the soundness of engineering judgment in selecting gas-engines as the prime mover for this important service. This is satisfactory, in view of the fact that the equipment of the Philadelphia system is without precedent in the history of large fire protection arrangements.

In dealing with the two rivals of gas—steam and electricity—Mr. Bibbins points out that the cost of maintaining a plant under steam, ready for instant operation throughout the year, is rather staggering; while liability to accident constitutes a very serious drawback to the use of electricity. As a matter of fact, in this case electric power was first considered; but it was soon abandoned, principally for the reason stated. Neither of the objections urged with regard to steam and electricity applies to gas, which, besides being at least equally as reliable as steam, has in this instance proved itself to be far cheaper. According to a report prepared by Mr. F. L. Hand, the Chief of the Water Bureau of Philadelphia, the estimated operating cost for a month, exclusive of fixed charges, upon the basis of one fire of ten hours' duration, indicates a saving, reckoning equal capacity, of 29 per cent. in favour of gas. He adds, however, that the cost of running per year will show a much greater difference in favour of the gas-engine, owing to the fact that gas is used only when required, which might be for a considerably less period than ten hours per month. Then, again, there are the fixed charges to be taken into account; and as the cost of equipment per million gallons capacity is given as $15,500 in the case of steam, and $12,250 for gas, this results in a further advantage of 21 per cent. to the latter—making the saving in operating costs for gas over steam an even 50 per cent.

After indicating the main features of the pumping-station, Mr. Bibbins turns his attention to the engines (which he describes at length, by the aid of several illustrations), as constituting the most interesting part of the plant. The starting of these is accomplished by means of compressed air at 150 to 200 lbs. pressure, though 100 lbs. has been found quite sufficient under any conditions; and this air, which is furnished by a duplicate set of two-stage compressors, is stored in eight seamless steel tanks, so as to be ready for use when needed. The compressors and igniter-generators are operated by the two smaller engines, which are used for this purpose as well as for driving the pumps. The average time required for placing the entire station in service is one minute per unit from the signalling of a fire. Of this, not above 45 seconds are consumed from the opening of the engine-throttle to the loading of the pumps to the requisite 300 lbs. working pressure; so that the entire capacity of the station is available in seven minutes from the signal, and the hydrants can be used within one minute. This result, remarks Mr. Bibbins, could hardly be accomplished with moveable apparatus. He adds that no complete official tests of the station and high-pressure system have been made up to the present time; but unofficial ones indicate that expectations have been realized. The results of working up to now show that an abundance of propulsive force is available within unprecedented time. The operating staff of this unique station consists of two men for each shift of eight hours—or only six men altogether.

This short notice will sufficiently indicate the scope of Mr. Bibbins's article, which will doubtless secure the attention of the suppliers of gas and gas-engines, who will naturally be pleased, though they may not be astonished, at what he has to say.

The Yorkshire Junior Gas Association will hold a meeting next Saturday at Dewsbury, when a paper will be read by Mr. P. Parrish, on "Purifying Material and Spent Oxide."

Manchester and District Junior Gas Association.—A meeting of this Association will be held next Saturday, when, by permission of Mr. William King, the Chief Engineer, a visit will be paid to the Garston works of the Liverpool United Gaslight Company. The party will assemble at the works at 3.15.

DESCRIPTION OF THE MARIENDORF GAS-WORKS OF THE IMPERIAL CONTINENTAL GAS ASSOCIATION.

CONSTRUCTION COMMENCED APRIL 25, 1900, COMPLETED OCT. 21, 1901.

By E. Drory, Chief Engineer, E. Körting, Engineer, and H. Schüller, Clerk of the Works.

(*Continued from p.* 690.)

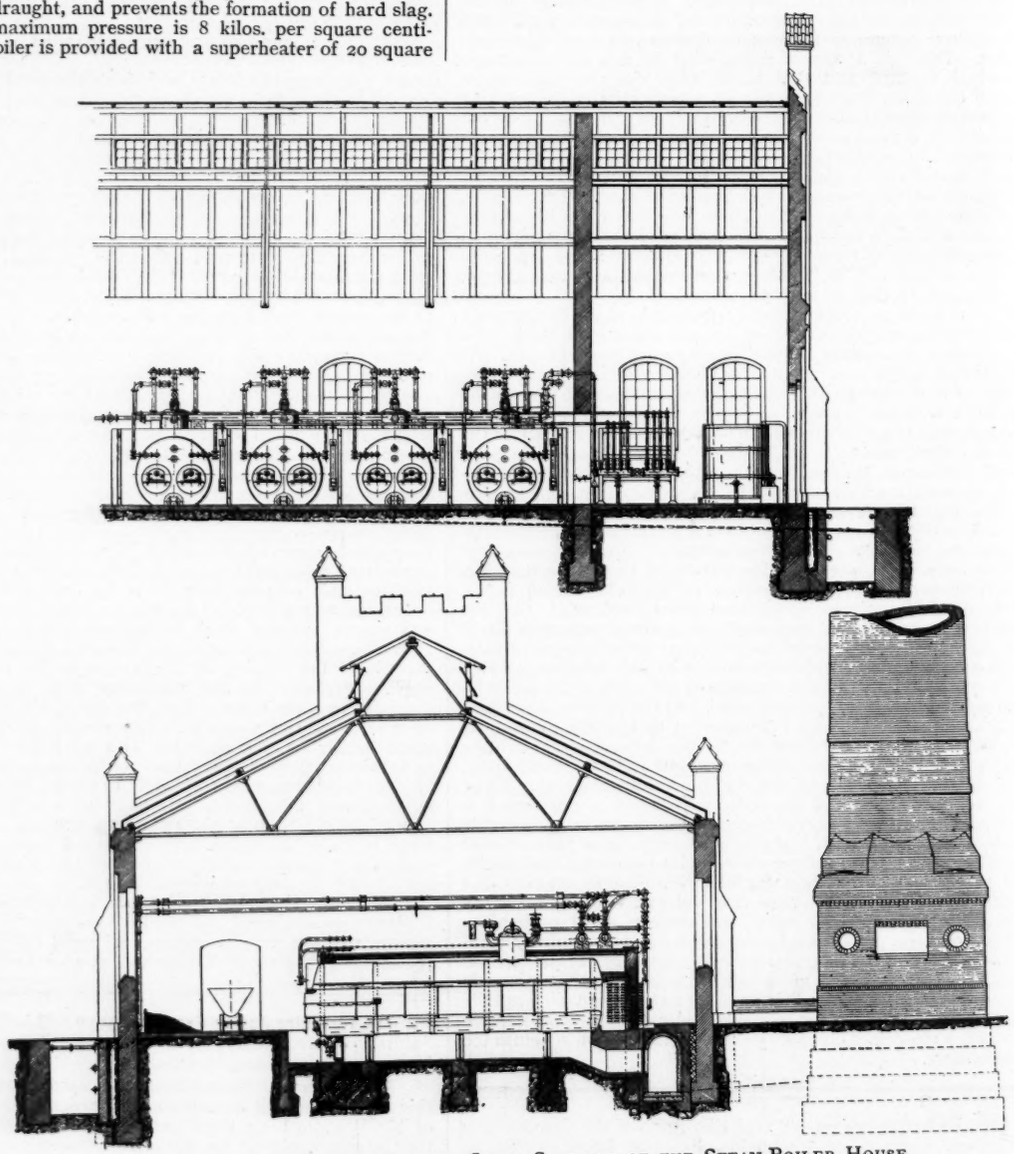
The Boiler-House, Pipe-Trench, and Overhead Loading Station.

The situation of the boiler-house, and the designing of the boiler plant, is naturally dependent on the eventual employment of the steam. Steam is wanted for the engines working the washers and exhausters, to warm the gasholder lutes, the purifier and station-meter houses, for all the pumps, and, finally, for the engines in the retort-house actuating the coke-conveyor, &c. The question was mooted as to whether electricity would not be the best form of motive power for the latter plant; but this idea was rejected—a steam-engine being the most reliable motive power, and the cost of steam on a gas-works relatively low. For the coal plant at the canal dock, on the other hand, where absolute reliability is not so necessary, electricity will be employed as motive power. The retort-house and the gasholder are about 500 yards apart; and in view of these distances, the boiler-house (later on boiler-houses) was placed in the most central position possible. Each boiler-house is designed for twelve boilers.

There are at present four Cornish boilers (see figs. 12 and 13), each of 80 square metres (860 square feet) heating surface. The firebars are constructed for fuelling with fine coke breeze on the Müller and Korte system. This simple and effective contrivance consists merely of a number of steam-pipes with many small holes, below the firebars. The escaping steam cools the firebars, promotes draught, and prevents the formation of hard slag. The indicated maximum pressure is 8 kilos. per square centimetre. Each boiler is provided with a superheater of 20 square metres heating surface, so that the steam is heated to 250° C. In the front room of the boiler-house are the feed-pumps and injectors, and a valve with the feed pipes and valves for all the boilers—all these being placed together and easy of survey; also a wooden vat for the feed water.

This latter first serves as cooling water for the Reutter condensers; is then warmed to 50° or 60° C. by the waste steam of the exhausters; and finally runs to the boiler-house. The water has only 6° to 7° of hardness, and so does not require to be purified. Two main steam-pipes branch off from the boiler-house. Each is in duplicate, and so arranged that both pipes of the duplicate main are recognizable by being painted in different colours, and so connected with all the principal engines. One of the steam-pipes runs to the apparatus houses, and from thence to the purifier-house and gasholder; the other pipe runs through the water tower to the coke plant and retort-house.

Owing to the long distances to be traversed, good insulation was necessary. The pipes were, therefore, first covered to the usual thickness with a new, very porous insulating material—so-called artificial tufa—and then boxed in by a wooden case filled with coke dust. The flanges could not be covered with wood, for fear of combustion (280° C. maximum temperature), and so were plastered over with clay. The loss of pressure to the end of the retort-house is 1 kilo. per square centimetre, when the pumps and



Figs. 12 and 13.—Longitudinal and Cross Sections of the Steam-Boiler House.

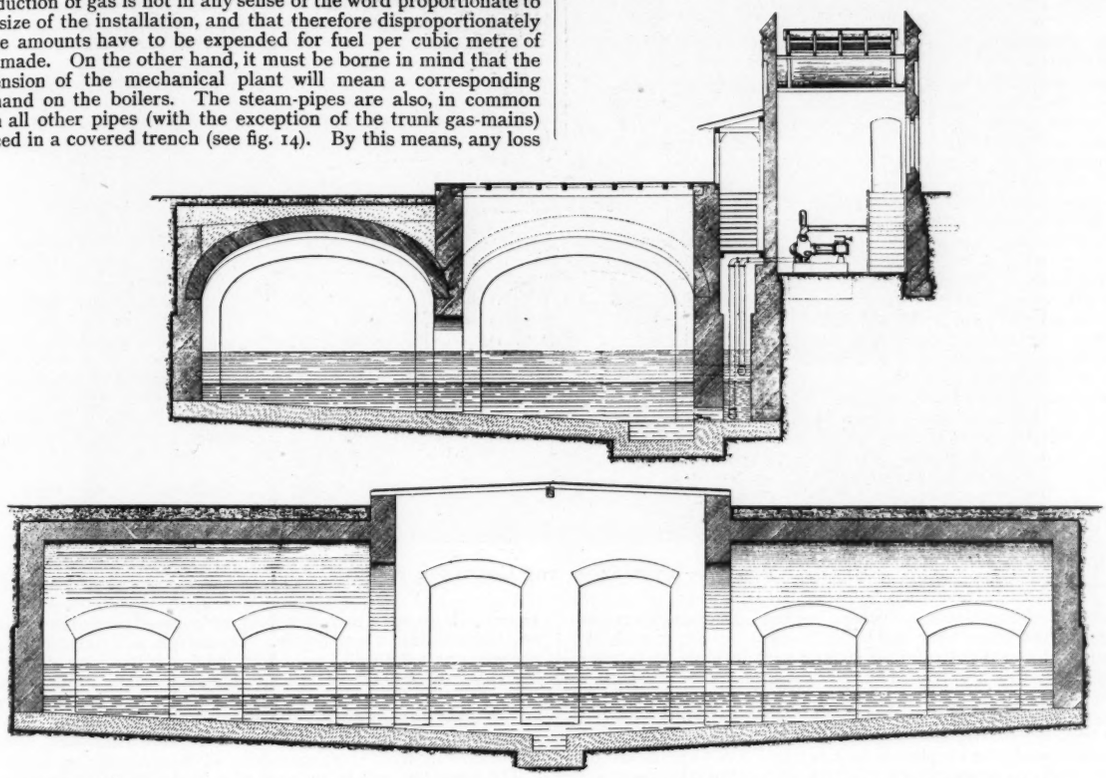
coke-plant engines between are all working; otherwise, hardly ½ kilo. per square centimetre.

The consumption of feed water is exactly controlled every day by water-meters, and the amount of fuel used carefully measured and noted. With 80 per cent. of coke dust and 20 per cent. of coke, an average monthly vaporization of 5·5 kilos. was attained. Without superheaters, as much as 6 kilos. would have had to be counted on. Notwithstanding these fairly good conditions, the consumption of fuel was very high—about 7·5 per cent. on the coal carbonized. The reason is to be found in the fact that the production of gas is not in any sense of the word proportionate to the size of the installation, and that therefore disproportionately large amounts have to be expended for fuel per cubic metre of gas made. On the other hand, it must be borne in mind that the extension of the mechanical plant will mean a corresponding demand on the boilers. The steam-pipes are also, in common with all other pipes (with the exception of the trunk gas-mains) placed in a covered trench (see fig. 14). By this means, any loss of valuable liquids, such as tar, ammoniacal liquor, cyanide, creosote oil, &c., is rendered impossible, and the work of cleaning and erection is easily and economically performed. A return on capital outlay may consequently be relied on in this connection. The following pipes lie in the pipe-trench: Two steam, cold water, warm water, gas (service) tar, weak ammoniacal liquor, strong liquor, creosote oil, cyanide slush, and sewage.

From this, it is clear that the pipe-trench connects the principal parts of the works with one another. These are the two apparatus houses, two wells, one boiler-house, two tar and ammonia tanks, two small pump-houses, the coke plant, retort-house, and overhead loading station. This latter building (see fig. 16) is the connecting link between the pipe trench and the railway. It lies consequently on the one side immediately above the former, and on the other at the edge of the steep embankment above the railway siding for bye-products, and contains four cast-iron tanks. Two of these are for tar or strong liquor, and are filled by the pumps at the tar-tanks—the contents flowing by their own gravity into the tank waggons below. The third is for cyanide slush. It is filled by the pumps at the cyanide washer, and its contents also run into the tank waggons. The fourth contains creosote oil from the railway waggons; and this is gradually sent to the naphthalene washers.

Water-Tower, Wells, Tar and Ammoniacal Liquor Tanks.

The water-tower is built of solid brickwork throughout, and serves primarily to hold the spring-water reservoir, of 150 cubic metres contents, the upper edge of which is 25 metres above the ground level. The water is obtained from two artesian wells,



Figs. 14 and 15.—Cross Section and Longitudinal Section of the Tar and Ammoniacal Liquor Tanks.

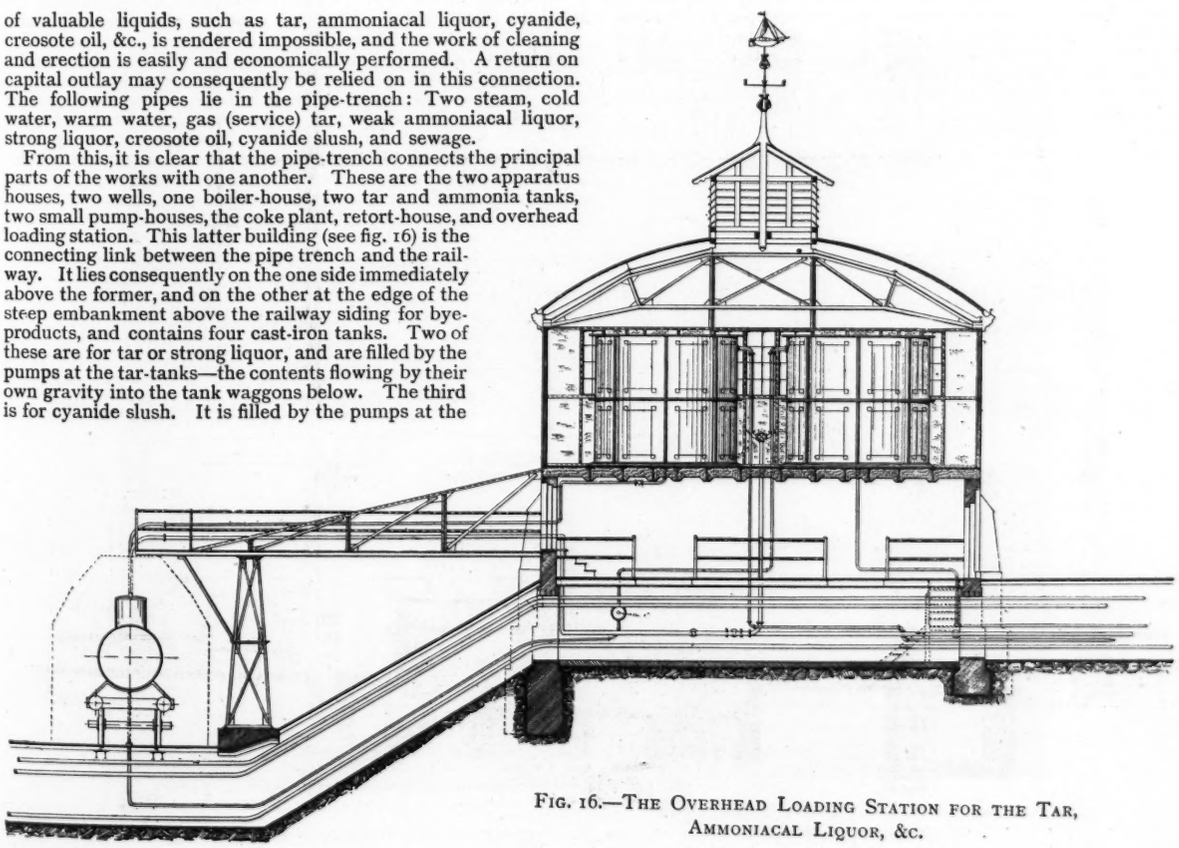


Fig. 16.—The Overhead Loading Station for the Tar, Ammoniacal Liquor, &c.

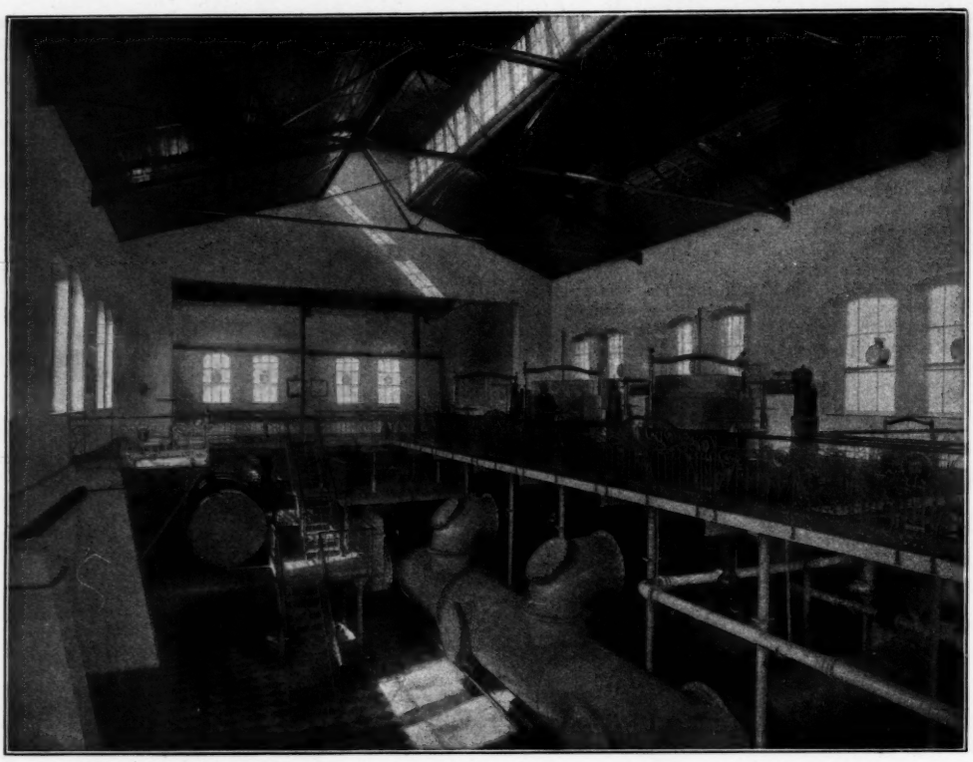


FIG. 17.—INTERIOR OF THE GOVERNOR HOUSE.

70 and 80 metres deep, one of which is situated beside the retort-house and the other near the boiler-house. In No. 1 well, the water rises through a stratum of clay 60 metres thick, up to a few metres from the ground. The Worthington pump serving it could therefore be placed above ground in the small pump-room between the retort-house and No. 1 tar-tank. In the case of No. 2 well, the ground rises considerably higher, and No. 2 pump had consequently to be placed in a bricked well-shaft below the ground-level. The water is soft (about 6° to 7° of hardness) and pure. It may, therefore, be used for all purposes on the works, and (notwithstanding a small percentage of iron) also as drinking water. From this water-tower, water-pipes under pressure lead off to all parts of the works. In many parts, hydrants are placed for fire extinguishing—so arranged that, in case of necessity, the jets can be thrown direct from the pressure of the pumps. Below the clean-water reservoir is another and smaller tank for weak liquor, to spray into the Reutter coolers, &c.

When designing the tar-tanks, it was kept in mind that only ammoniacal liquor of a high degree of strength was to be sent away. There were therefore two tanks necessary—one for weak and the other for strong liquor. The former (of 1300 cubic metres capacity) was naturally placed in the low-lying ground near the retort-house, where all the products of condensation between the retort-house and the exhauster could flow; the second tank (about 2000 cubic metres) was placed, on the other hand, in the vicinity of the apparatus houses, to receive the more valuable liquor flowing from the apparatus.

The thin tar which accumulates in No. 2 tank, is regularly pumped into No. 1 tank, where it gives off a certain quantity of its ammonia to the weak liquor, and mingles with the thick tar from the retort-house. No. 1 tank contains, therefore, the main stock of tar, covered by a thin layer of liquor. In No. 2 tank is stored all the strong liquor, with a thin layer of tar underneath, which may, of course, be increased at will when the tar sales diminish. The floors of the tanks are made with a slope ending in a sink at one corner, from which the pumping is done. Above the sink is a small building with one tar and one liquor pump. Both tanks (see figs. 14 and 15) are built of clinker bricks laid in

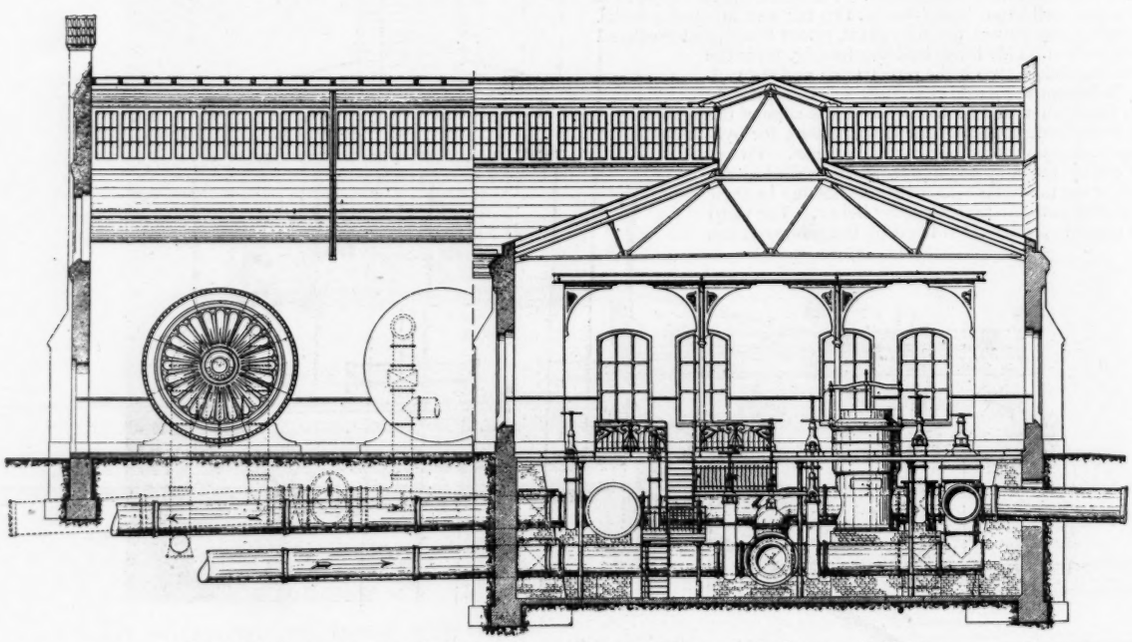


FIG. 18.—LONGITUDINAL SECTION OF THE STATION-METER AND GOVERNOR HOUSE.

cement, and the roofs arched over. Part of the tank is covered with wood, so that ventilation can be provided when repairs are necessary or the tank is to be cleaned. The tar brought out for sale shows on an average 3 to 4 per cent. of liquor, as against 2 per cent. in hydro-extracted tar. As long as one is able to carbonize a fair proportion of Silesian coal, which yields a quality of tar easily separable from the liquor, there is no necessity for the artificial extraction of liquor and tar, and the above simple arrangement answers every purpose.

Station Meter and Governor House.—See Figs. 17, 18.

In considering the plan and situation of the station meter and governor house, as well as that of the apparatus therein contained,

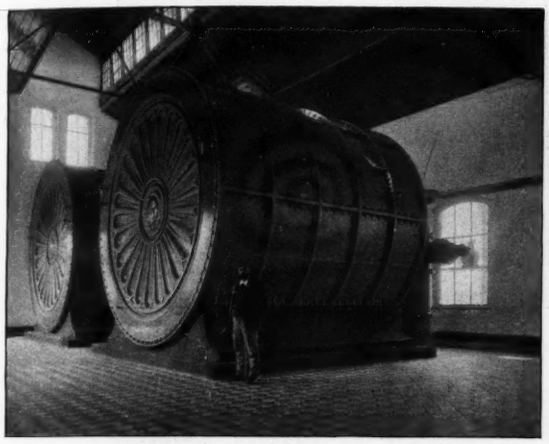


Fig. 19.—Two of the Station-Meters.

the following point had to be kept in view. It was thought advisable to bring together the station meters, governors, and the inlet and outlet valves of the gasholders in one room, so as to have the regulation of these well in sight and under control. Consequently, a great number of pipes had to be led to one small area of ground, and that without any crossing. To attain this object, the row of governors had to be kept at right angles to the row of gasholders, and the central line through the station meters kept parallel to that through the purifiers. At the same time, it had to be borne in mind that it was also necessary to reach the Lahkwitz Strasse to the south and the Ring Chaussee to the north, with a large number of pipes. For this purpose, the most suitable was evidently in Newton Strasse, which bisects the works in the direction of north and south. It was therefore proposed to erect two governor houses for the fully built-up works—one for the western and the other for the eastern part. Each one is sufficient for at least 125 million cubic metres of gas per annum.

The station-meter house—a long but not a very high building—is, in fact, a wing of the governor and valve house. Three parallel streams of gas flow from the three purifier-houses to the six station meters, and unite in the governor house in a 1500 mm. main. From this, there branch off at right angles the three inlets to the gasholders. These three streams of gas flow back from the gasholders in the same direction, unite also in a 1500 mm. wrought-iron pipe, pass through the governor-house, and go hence along Newton Strasse, either to the north or south.

The mains in the station-meter house are in the ground. The governor-house, on the contrary, possesses a deep basement story, to enable the inlet and outlet pipes of the gasholders to be carried one above the other, and to bring the valves within easy reach. Both houses have continuous sky-lights, with numerous pivoted windows. The floor of the governor-house consists, on the ground level, of openwork cast-iron plates, as in the apparatus houses, and extends only as far as the work in the house necessitates. In the centre is a wide railed-in opening in the floor, through which can be seen the whole system of mains and valves. The six station meters (there are only two at present erected—see fig. 19), are of 90,000 cubic metres daily capacity each.

The governors, of 1000 mm. aperture, are of the usual water-ballast pattern. Every valve is so made that the spindle and wheel screw out of the valve-head when the valve is opened. Further, the inlet, outlet, and bye-pass valves are painted respectively black, white, and red—here as well as in every part of the works. It may, therefore, be said that ventilation, ease of survey, and safe working have been provided for to the utmost.

Offices, Workshops, Bath and Dining Rooms.

The office and dwelling-house are built of red brick, and contain the offices, apartments for two engineers, one foreman, and one porter. The workshop building provides room for the smithy, locksmith's shop, carpenter's shop, and store. Of the bath and dining rooms, one is situated close to the retort-house, and connected therewith by a covered way, so that the stokers may go to and fro without being in a draught. On the first floor a spacious dining-room (see fig. 20) is provided, the walls of which are lined with glazed tiles, the pavement consisting of floor-tiles. There are a number of gas-stoves furnished for keeping food warm, and gas-ranges for cooking it. On the ground floor are the dressing-rooms and bath-rooms, as well as the water-closets. The construction of these rooms is identical with that of the dining-room. Each bathing compartment (see fig. 21) consists of a shallow basin (of cement), a wooden bench, and a shower-bath nozzle above them, for both hot and cold water—the former heated by direct steam, at the wish of the bather. There are no partitions between the baths, as these are very difficult to keep clean, especially when made of corrugated iron, and also because a grimy stoker frequently requires the aid

Fig. 20.—The Workmen's Dining-Room.

FIG. 21.—THE STOKERS' BATH ROOM.

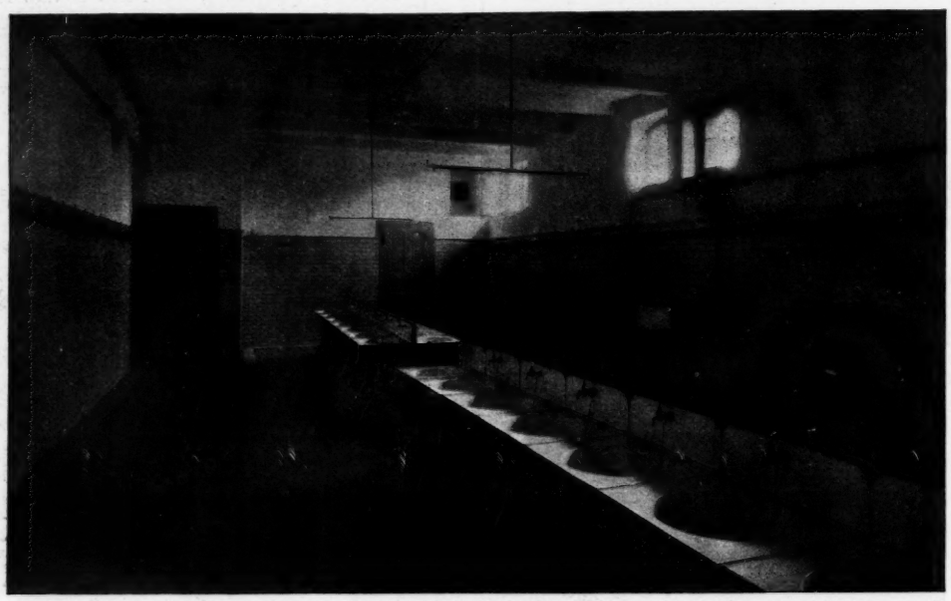


FIG. 22.—ONE OF THE BASEMENT LAVATORIES.

of a comrade. For older, delicate, or deformed persons, there are five cabins in the second bath-house, the partitions of which are of glazed tiles held in iron framework. No. 2 bath-house is for artisans and yard labourers, and is built on similar principles, though on a considerably larger scale than No. 1. Next to the large dining-room is a canteen, fitted with all necessary appliances for cooking with gas, retailing beer, &c., as well as a neat table and various cupboards for the use of the lessee and his wife. The lessee pays a moderate quarterly rent (which is given to the workmen's sick fund), and has to provide food and drink according to the tariff. For instance, the midday meal—consisting of soup, meat, and vegetables—costs 40 pfg. (5d.).

The dressing-room, with a locker for each man, is situated on the ground floor, as are also a separate room and bath-room for the foremen. The basement contains, besides a bath-room, a lavatory with a large number of enamelled cast-iron wash-basins for those men who have no need of a full bath—see fig. 22. Here are also a beer cellar and a storing place for bicycles. Both bath-room and canteen are fully appreciated by the men, who take every advantage of them. The Workmen's Choral Society meet once a week in the dining-room, and on occasions, performances and dancing take place there. The garden lands surrounding the various buildings are cultivated by the workmen employed, who obtain flowers, fruit, and vegetables from them.

There are few men who have leisure and antiquarian tastes who do not find a pleasure in discoursing upon the history of the town in which their early years were spent. The former Secretary of the West Kent Gas Company, Mr. R. Peake Keys, is the fortunate possessor of both of the above-named qualifications of an agreeable *raconteur;* and in a little book which has been published by Messrs. Horace Marshall and Son, and of which he has sent us a copy, he has recorded some reminiscences of the important Cinque Port of Dover, of which he is an ancient freeman. In the course of his review of the political, social, and religious history of the town, he necessarily refers to the original gas and water works, of which his uncle, Mr. James Peake, was Manager. The ideas of this gentleman appear to have been much too advanced for his easy-going Directors, who, we are told, were "astounded at his new projections." Consequently, both he and his works were about half starved. To him, however, succeeded Mr. George Anderson, under whose energetic management the business rapidly increased. New works were erected by him, and, in co-operation with Mr. R. Hesketh Jones, the undertaking was started on the successful career which has brought it into the excellent position it now occupies. Mr. Keys is very proud of his town's ecclesiastical history; and he claims for the church of St. Mary in the Castle greater antiquity than that of St. Martin at Canterbury. On this, however, we will not venture to express an opinion. We may add that he is devoting to the Gordon Boys' Home at Dover the profits realized by the sale of his book.

THE BRITISH WESTINGHOUSE COMPANY'S WORKS AT MANCHESTER.

In describing the meeting of the Manchester District Institution of Gas Engineers, which took place on the 27th ult. (in our issue for March 1), we deferred giving an account of the visit to the British Westinghouse Company's works at Trafford Park. We are now able to put before our readers an illustrated description of these works, which will be of interest to every engineer.

On arrival at the works about 11 a.m., the members, about 80 strong, were met by a number of officials of the British Westinghouse Company, among whom may be mentioned Messrs. J. G. Walthew and G. J. Wells, who afterwards took part in the proceedings at the Mosley Hotel. The works consist of five main shops, all running north and south and parallel to each other, and, in front, a large office building, handsomely fitted up and furnished internally, in which are accommodated such of the staff as are not actually engaged in the shops—draughtsmen and designers, superintendents, the commercial departments, and the management. Directly behind this building is the great machine shop, 430 feet wide by about 1000 feet long, divided longitudinally into five bays, two of which are clear to the roof—a height of over 70 feet.

The effect on entering this shop of the view from the gallery down the whole length of the aisles, is most impressive. Truly this may well be called a palace of engineering. We are enabled to reproduce photographs which do better justice to the subject than any verbal description. Every care is taken to ensure the most comfortable conditions for the workmen; the heating and ventilating systems being thoroughly worked out, and lavatories, &c., being provided on a far more liberal scale than is usual. The lavatories in the machine shop are all located on the mezzanine floor of the three aisles between, and on either side of, the two main bays. These aisles have two working floors—comparatively light work being done on the galleries, and heavier machining, testing, &c., on the ground floor. One of the main aisles is devoted exclusively to electrical and the other to mechanical work—that is, the manufacture and testing of gas-engines and steam-turbines. It is, of course, with this latter that the visitors were principally concerned.

Next to the machine shop lies the steel foundry, contained in a building 600 feet long by 170 feet broad, and about 90 feet high, clear to the roof, having no galleries. About one-third of the length is devoted to the forge and smiths' shop, and the remainder

Westinghouse Works.—One of the Main Aisles of the Machine-Shop.

to the steel foundry proper. The plant includes two Wellman-Seaver open-hearth rolling furnaces; and two Duff gas-producers are utilized for heating these. Two 50-ton electric cranes span the main bay of the building; and numerous smaller travellers and pneumatic jib cranes handle lighter material near the sides. Leaving the steel foundry, one next enters a long and comparatively narrow building, running parallel to it, and containing the brass foundry, foundry storage, and malleable iron foundry. In line, and end on, with this building is the pattern shop, which is conveniently located for all the foundries. Next comes the iron foundry, which occupies the whole of a building similar to that which accommodates the steel foundry, and is at the present time being further extended by the addition of a wide side bay. There are two Whiting cupolas; and the blast is furnished by Sturtevant blowers. All castings required in the works, up to 30 tons weight, are made here.

Having indicated the general lay-out of the works, we can now return to the aisle in the machine shop, in which the gas-engine work is for the most part done. This aisle is 90 feet long, and runs the full length of the shop. It is spanned by two 50-ton electric travelling cranes, each with a duplicate hoisting gear of 10-ton capacity; so that moderate weights can be efficiently handled. A third crane of similar capacity will shortly be added. In addition, there are pneumatic jib cranes, with a considerable radius of action, fixed to nearly every pillar. A railway track sunk in the flooring extends from end to end; and steam-cranes with adjustable jibs travel up and down this, conveying the lighter parts of engines to and fro. There are also two cross-tracks in the length of the shop, which facilitate communication with adjoining aisles. The northern end of the aisle—that is, the end near the offices—is mainly occupied by material which has been tested and is waiting to be shipped, and by rough castings, &c., which have come from the foundries and are to be machined and erected as parts of the complete engine.

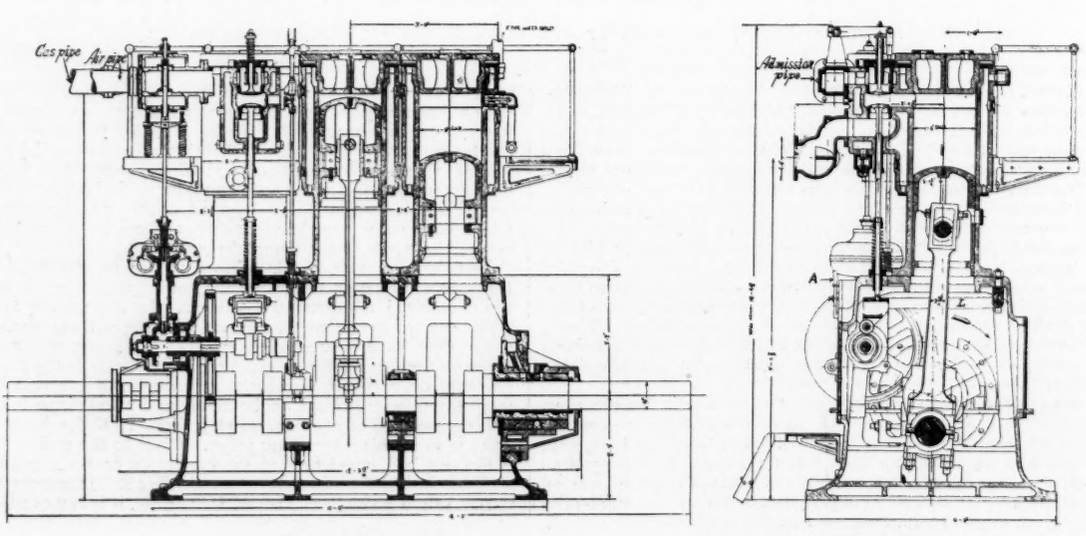
Just beyond this, work is in progress on the huge steam-turbines, ranging up to 8000-horse power, which are in hand for the London Underground Railways. In the middle are to be found many interesting machine tools, some of them of enormous size. One huge boring-mill is capable of turning or boring work up to 28 feet in diameter. Just past the centre is the gas-engine erecting department, to which are brought all the various parts from the different shops, to be assembled into complete engines. A large number of engines, ranging from 10 to 600 horse power, were seen in this interesting stage. Close to the end of the aisle is the test-bed, consisting of heavy slotted cast-iron plates, with surfaces finished accurately, mounted on a solid masonry foundation. When an engine is ready for testing, it is removed—bodily in the case of the small sizes, and partially dismantled if large—from the erecting department, and is firmly bolted down to the test-bed. It is then connected up to the gas and water mains, and

WESTINGHOUSE WORKS.—INTERIOR OF THE STEEL FOUNDRY.

run either with an electrical load, or with a Prony friction brake, at various powers for sufficiently long periods to bring out any defects, and to establish a complete record for each engine. After testing, the engines are dismantled, painted, and shipped.

Mr. George Westinghouse was among the first to realize the great advantage of utilizing inflammable gases by combustion in the cylinder of the engine instead of under the boilers; and the extensive investigations conducted by him and his assistants resulted in the commercial development of a type of engine widely different from others of that period. A special feature of these engines was that they gave the same uniformity of running that was possible with steam-engines. This characteristic of the original design, which is retained in the engine to-day, is attained by controlling the charge of explosive mixture according to the load, so that a constant series of explosions without intermission is obtained. In the "hit-and-miss" system of governing, the explosion is omitted at every few cycles, according to the load on the engine; thus the speed fluctuates constantly between the maximum and minimum allowed by the governor. Uniformity of revolution is further promoted in the Westinghouse engine by employing two or three cylinders instead of a single one. These principles are employed in single-acting vertical engines with two cylinders for sizes up to 50 brake horse power, and in three cylinder engines up to 250 brake horse power. Larger engines than this are now made double-acting, effecting considerable economy in material, and allowing the production of a commercial engine up to very large sizes at reasonable cost. The standard double-acting vertical design is built up to 1500 brake horse power; and to meet certain conditions of building, space, &c., horizontal double-acting engines both above and below 1500 brake horse power are made.

The line illustration below represents an elevation (front and end views) of a Westinghouse three-cylinder vertical single-acting gas-engine, rated at 250 brake horse power with producer gas. The gas and air enter the mixing-valve through the gas and air pipes shown to the left hand in the figure. From the mixing-valve the mixture passes to the main admission-pipe at the same level. This pipe runs alongside the three cylinders at their upper ends, in proximity to the admission-valves. They are of the mushroom type, operated by vertical rods actuated from the cam shaft inside the crank case of the engine; the valves being opened by the movement of the rods and closed by spring action.

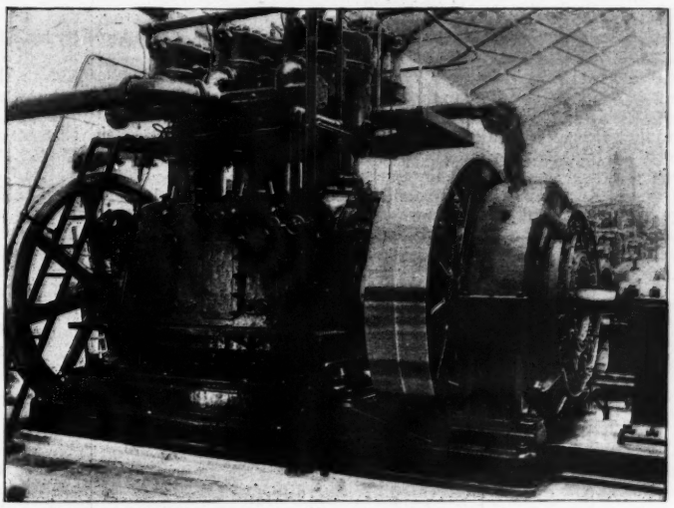


FRONT ELEVATION. END ELEVATION.

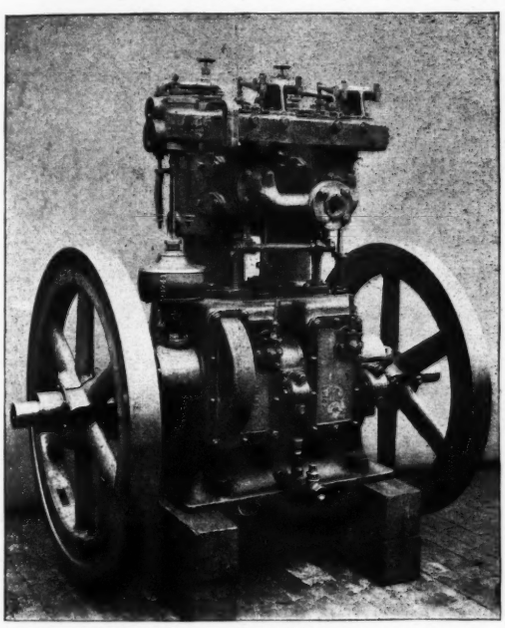
WESTINGHOUSE SINGLE-ACTING THREE-CYLINDER GAS-ENGINE.

A spiral spring further serves to maintain the roller on the end of the operating rod in contact with the cam. The exhaust-valves, of similar type, are operated direct from the same cam-shaft. A horizontal lever has its fulcrum inside the engine crank case at the side opposite the cam-shaft. This lever extends across the inside of the crank case, and terminates in a roller running on the exhaust cam, and maintained in contact with it by spring pressure from above. Thus the lever is moved up and down by the rotation of the cam, and imparts motion to the stem of the exhaust-valve, which is continued downward from the valve-box through the top of the crank case, its lower end resting on the lever.

There is only one cam-shaft for the operation of all the valve and other motions. This shaft is inside the crank case, and is driven from the crank-shaft of the engine through 2 : 1 gearing. It is lubricated by the cranks splashing in an oil-bath. The governor, which is of the fly-ball type, cased in, and sufficiently sensitive to allow of very close regulation, is driven by a vertical shaft and gearing off the same cam-shaft. It controls the speed of the engine by actuating a valve on the admission-pipe; thus altering the quantity of the explosive mixture drawn in at each suction stroke without varying the quality. This method of governing is so accurate that Westinghouse gas-engines are direct-coupled



THREE-CYLINDER 250-HORSE POWER WESTINGHOUSE GAS-ENGINE AT THE WALTHAMSTOW ELECTRICITY WORKS.



TWO-CYLINDER WESTINGHOUSE GAS-ENGINE (ASSEMBLED IN SHOPS).

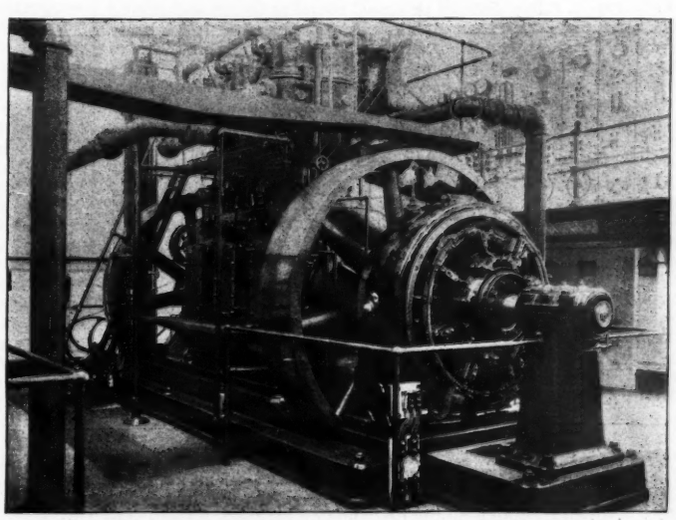
to both direct and alternating current electric generators, and drive them in parallel in the same manner as the best steam-engines. The explosive charges are ignited by the making and breaking of an electric current between suitable contacts in the compression space; the igniter being actuated by a simple tripping-device. One explosion is obtained at every revolution in two-cylinder engines, and one at every two-thirds of a revolution with the three-cylinder type.

The engines are started by compressed air. By turning one of the three handles shown outside the crank case, the cam opening the inlet-valve of one of the cylinders is thrown out of action, and the roller at the end of the exhaust lever operating the exhaust-valve engages with an auxiliary cam; the effect being to open the exhaust-valve at each revolution, instead of at every second revolution. The cylinder is cut off from the gas supply and connected to a compressed-air tank, so that, with the valve functions altered, it acts as a simple compressed air motor. As soon as the explosion takes place in the other cylinders, the compressed air is cut off, the cams are thrown back to their running position, and the starting cylinder comes into regular operation as an explosion cylinder. Even a large engine can be started up by one man within a minute—a most important advantage over the steam-engine, which takes a much longer time to warm up and start. The design of the engine allows a comparatively high speed, which constitutes an essential advantage.

Much interest was excited by one of the large double-acting gas-engines now in course of construction—namely, a 600-horse power, with cylinders 24 inches by 30 inches. This machine resembles externally, to a marked degree, a vertical slow-speed steam-engine. There are two double-acting cylinders mounted on the top of heavy **A** frames, one on either side of the driving pulley. The upper parts of the **A** frames form guides for the cross-heads; while the cranks revolve in the lower part of the frame. The bearings are within the **A** frames; and the cranks are of the disc overhung type. The cam-shaft, which is supported by brackets bolted to the upper part of the frames, is driven through worm-gearing by the crank-shaft, and bears cams for the operation of admission and exhaust valves for the two ends of both cylinders. As the heat generated in the cylinder of such an engine is very great, all parts have to be water-cooled. The cooling in this instance has been most carefully thought out; the cylinders, cylinder heads, pistons, and exhaust-valves being all water-cooled by simple and efficient methods.

The single-acting engines are used with natural gas, town illuminating gas, petrol, or producer gas as fuel; the double-acting engines are run with coke-oven gas and blast-furnace gas, in addition to the above-mentioned gases, if desired. It is generally recognized that gas-engines using producer gas made from a cheap quality of coal form an economical source of power; and rapid extension in their use may be anticipated with certainty. The successful utilization of coke-oven and blast-furnace gas direct also opens up an enormous and growing demand for suitable engines, and will, there is no doubt, effect an almost incalculable saving in the world's fuel supply.

In this connection an interesting side-light is shown upon Mr. Kendrick's paper on Carburetted Water Gas, read at the Mosley Hotel after the visit. Mr. Walthew, of the British Westinghouse Company, considered the value of an admixture of carburetted



THREE-CYLINDER 250-HORSE POWER WESTINGHOUSE GAS-ENGINE AT THE BIRMINGHAM SMALL ARMS COMPANY'S POWER HOUSE.

water gas as against pure coal gas from the point of view, not of its illuminating power, but as regards the energy obtainable from its combustion in a gas-engine. Mr. Walthew took the case of pure coal gas of 18-candle power, containing 37·1 B.T.U. per candle power, compared with a mixture of coal gas and carburetted water gas, also of 18-candle power, but only containing 32·27 B.T.U. per candle power. It is apparent that when a gas-engine is driven from the mixed gas, a greater volume per brake horse power will be consumed than when using pure coal gas of the same candle power. Reckoning upon 10,000 B.T.U. as about the total heat necessary per brake-horse-power-hour, it will be seen that when coal gas is used the consumption will be about 15 cubic feet per hour, and when mixed gas is used about 17·2 cubic feet per brake-horse-power-hour.

$$\text{No. of cubic feet of gas used when coal gas of 18-candle power is supplied.} \Big\} \quad \frac{10{,}000}{37{\cdot}1 \times 18} = \text{about 15 cubic feet per brake-horse-power-hour.}$$

$$\text{No. of cubic feet of gas used when mixed gas of 18-candle power is supplied.} \Big\} \quad \frac{10{,}000}{32{\cdot}27 \times 18} = 17{\cdot}2 \text{ do.}$$

Mr. G. J. Wells, of the British Westinghouse Company, also made some interesting remarks with regard to the efficiency of the gas-engine. He pointed out that the more scientific way of measuring efficiency was to calculate the ratio,

$$\frac{\text{Heat utilized per brake horse power.}}{\text{Total heat supplied.}}$$

By means of this ratio, it was possible to compare the efficiencies of the various types of motors. The Westinghouse gas-engine utilized about 25 per cent. of the total heat supplied to it—a figure which placed it very far in advance of the best steam-engine practice. Mr. Wells laid stress on the advantages of the method of governing adopted in the Westinghouse engine, which rendered it, unlike the majority of gas-engines, available for direct coupling to alternators in electric power and light stations.

The Westinghouse Company have already made a large number of gas-engine installations in this country. Perhaps the most interesting is the electric station of Walthamstow Urban District Council. This plant was started in the face of much criticism, with an initial capacity of 400 brake horse power in four units. Soon after, three 250 brake horse power units were adden; and a further increase of three 265 brake horse power units has now been arranged for.

A word before we close with regard to producers. All sorts of producers are used with Westinghouse engines—such as Mond, Dowson, Loomis-Pettibone, &c. It is probable that the continually growing demand for power in the Company's shops at Manchester will be supplied by electric generators driven by gas-engines, which, in turn, will be supplied by producer plant of different makes—say, 2000-horse power capacity of each type. This should certainly give the Company an unequalled opportunity of comparing the merits of the various producers.

THE LATE ALDERMAN JOHN ANNAN.

We were unable, in the announcement last week of the death of Alderman Annan, of Wolverhampton, to do more than briefly mention his connection with the gas industry. We are now, however, in a position to give some particulars of his life-work. A Scotsman by birth, and commencing life at the bottom of the ladder, John Annan, by his straightforward conduct, businesslike abilities, and perseverance, raised himself to a good social position, and gained the confidence and esteem of his fellow-townsmen. In his early manhood, Mr. Annan worked for some time in Dublin as a journeyman fitter, but went to Wolverhampton in the late fifties to take an engagement at the old gas-works. After being there a short time, he accepted an appointment in connection with the management of the gas-works at Sheerness. He was not, however, away for long. Returning to the town, he was engaged as Assistant-Manager, under Mr. Proud, at the new branch works which had been erected on the Stafford Road, where he took up his residence. In 1864, Mr. Proud relinquished the duties of General Manager and Engineer of the Gas Company to take an appointment of a similar character in Bombay; and then Mr. Annan was selected to succeed him. He held the position until March, 1898, when he retired on a pension. In the long period during which he held the managership at the gas-works, he was the means of introducing several improvements, as the result of which the price was successively reduced from 3s. 4d. per 1000 cubic feet, at which it stood in 1864, to 2s. 4d. in 1883, and to a lower figure in 1889. In addition to his connection with the Wolverhampton Gas Company, Alderman Annan was a Director of the Bilston Gas Company, Chairman of John Brotherton, Limited, and was commercially interested in several other Staffordshire undertakings. As mentioned last week, Alderman Annan was a member of the British Association of Gas Managers, which he joined in 1866, and of the Midland Association, of which he was President in 1886. Notwithstanding all the demands on his time, he was able to give attention to municipal affairs. In 1883, he was elected one of the representatives of St. Mark's Ward in the Town Council; and twelve months later, yielding to the pressure put upon him by his colleagues, he accepted the position of Mayor. During his year of office, he discharged the responsible duties devolving upon him to the great satisfaction of the Council and the town. In acknowledgment of his services, he was elected an Alderman in January, 1885. Sympathetic references to the loss the town had sustained by the death of Alderman Annan were made by the Mayor (Alderman L. Johnson) and the other Magistrates at the Police Court on Thursday, on which day the funeral, which was of a public character, took place at Wolverhampton Cemetery. It was witnessed by a large number of people; and on every hand there was evidence of the great respect in which the late Alderman was held. Mr. Percy G. Winstanley and Mr. A. Jones were present in their capacities of Engineer and Secretary of the Wolverhampton Gas Company; Messrs. Holcroft and Reeves (Chairman and Engineer) represented the Bilston Gas Company; Messrs. Cooke and Cranmer, the Midland Association of Gas Managers; and there were deputations from other bodies.

OBITUARY.

Mr. Henry Grove Morris, of the Kent Water-Works Company, died at his residence, Eliot Park, Lewisham, on the 12th inst., in his 67th year.

The death occurred on the 8th inst. of Mr. Edward Christian Berridge, of Cheltenham, who was for upwards of fifty years a Director of the Leamington Gas Company. The deceased gentleman was in his 86th year.

PERSONAL.

Mr. W. J. Wynne has been appointed Secretary of the Sunbury Gas Company, in succession to Mr. Fletcher, whose resignation was announced last week.

Mr. R. H. Nuttall, of Milnrow, has been appointed Engineer and Secretary to the Marsden District Council, in succession to Mr. A. Halliwell, who has obtained the position of Manager of the Lytham Gas-Works.

Owing to the continued ill-health of his family, Mr. W. H. Reed, who has been for nearly four years Manager and Engineer of the Whitchurch and District (Hants) Gas Company, Limited, has been compelled to resign the position. Mr. Reed's successor is Mr. J. F. Watson, of Felixstowe.

Gas Companies' Discounts.—In the case of three unopposed Gas Bills upon which the Chairman of Ways and Means has lately reported to the House—the Felixstowe, the Gomersal, and the Wellington (Somerset)—the Committee who had the Bills under consideration stated specifically, in regard to the clauses relating to discounts, that, in their opinion, "no reason exists for the limitation of the amount of discount to be given by the Company in respect of large consumption of gas."

Public Companies and Municipal Representation.—At the annual meeting of the Association of Chambers of Commerce recently, the members considered and passed two resolutions, moved on behalf of the Manchester and London Chambers, expressing dissatisfaction with the refusal of representation to limited liability companies under the existing municipal electoral regulations, and their consequent powerlessness to influence or regulate the taxation and expenditure of municipalities, and supporting the principle of the Bill to be introduced in the present session to give effect to the resolution passed at the annual meeting of the Association in 1902 relating to the franchise in municipal and other local elections for corporations, limited liability companies, and other public companies—limiting the voting power to one vote per corporation or company.

The Improving Outlook for the Gaslight and Coke Company.—Confirming the opinion expressed several times of late in the "Journal," that the outlook of the Gaslight and Coke Company is distinctly improving, the "Pall Mall Gazette" had the following paragraph under their City Notes: "Shareholders in the Gaslight and Coke Company will be glad to learn that during the current half year unusually satisfactory progress has been made. Twelve months ago, the Directors had no reason to be dissatisfied with the results obtained; but a comparison of the output of gas from Jan. 1 to the commencement of March in the two years shows an increase over 1903 of nearly 5½ per cent. This improvement is the more significant when it is remembered that important changes have recently been made in the head-quarters staff. Without in any way reflecting on the services rendered by the late Secretary, it is becoming plainer and plainer that decentralization of administration is yielding most beneficial results. We may also mention that, when the next report is issued, it will be found that working expenses have diminished. The ordinary stock is quoted at about 88—thus yielding 5 per cent.; but it must be remembered that much has yet to be accomplished in the way of bringing the plant up to the standard of modern requirements, and North London will not go on indefinitely paying 9d. more for its gas than the South."

THE SETTLE-PADFIELD PROCESS—IS TAR A NECESSITY?

By Mr. GEORGE HELPS, of Nuneaton.

I have read with interest, and some surprise, Mr. Norton H. Humphrys' remarks on the references I made to the Settle-Padfield process in my address to the Midland Association of Gas Managers.

I may say, at the onset, that my interest in the Settle-Padfield retort is more than an academic one, for I have a commercial interest in any system that claims to reduce the costs of the manufacture of gas, as well as a student's interest, and an anxiety to get at the bed-rock truth in regard to it. Mr. Humphrys seems to think that, with ordinary processes, 12,000 cubic feet of gas to the ton can only be made from a high-quality coal. This is not the case. If coal be subjected to a high temperature, and carbonized free from back-pressure, such a result can be obtained from the common coals that Staffordshire and Derbyshire produce. I notice that in the article on this system of June 12, it is stated that, by the ordinary process, Somerset or Durham slack yields a trifle over 10,000 cubic feet of gas per ton. I venture to state that there are people who could make 12,000 cubic feet with these coals.

I am at a loss to follow all the reasoning of Mr. Humphrys. For instance, he says that I have overlooked the fact that 13,000 cubic feet per ton and no tar "was obtained from a *cheap inferior coal* of a quality that no gas engineer in the kingdom could keep his holders up on, if used in the ordinary process." Mr. Humphrys in an article in the "JOURNAL" for June 23 last, gives a laboratory test of this "*cheap inferior coal*" showing a yield of 11,736 cubic feet to the ton of 11-candle gas and 13 cwt. 84 lbs. of coke!

The tests given in your issue of Jan. 12 of this coal, carbonized by the Settle-Padfield process show 13,282 cubic feet of 13·60-candle gas, and 14 cwt. 42 lbs. of coke—being an increase over the laboratory test of 1546 cubic feet and 70 lbs. of coke, against which the value of the tar has to be set. Whether or no tar is a necessity, need not concern us at the moment. Obviously if the production of tar were reduced by any such process, the value of it would be very considerably enhanced.

He also says that from 1 cwt. of tar he takes the illuminating constituents and puts them into the gas, and adds to his coke 1 cwt. or 1½ cwt. It would be very interesting to know how this is done. He also claims for the Settle-Padfield process that "the working temperature need not be so high as that required to ensure satisfactory results in ordinary working." On what can such a statement as this be based? If temperature is not to be the most essential feature in the economical carbonizing of coal, a good many of us are very much at fault. I can understand that with the Settle-Padfield retort the carbonizing temperature cannot be allowed to be so high as in ordinary carbonizing processes, owing to the proximity and the position of the cast-iron mouthpiece, &c., which would be difficult to keep cool unless the temperature were low.

Again, I think Mr. Humphrys is wrong where he says: "The charge, instead of being gradually brought up to the proper carbonizing temperature in the course of an hour or two, acquires the temperature almost instantaneously." Of course, it is to be expected that a charge of 7 lbs. will be carbonized more quickly—raised to the necessary temperature more quickly—than a greater quantity. But Mr. Humphrys has not shown, nor claimed for the Settle-Padfield system, that by it more coal can be carbonized in a given time; and surely this is the point.

A 3-cwt. charge every six hours is equal to a 14-lb. charge every 15 minutes, which has to be raised in temperature from about 50° to 2000°. If 56 lbs. of coal be put in every hour, the coke from 56 lbs. will be taken out every hour or thereabouts; and, therefore, we can assume that the retort, when charged completely, contains the then residue of the partially carbonized 3 cwt. of coal, and that after the equivalent in coke of the 56 lbs. of coal has been drawn, the retort contains the residue from 3 cwt. less 56 lbs. = 2½ cwt. of coal; and the heat of this mass of carbon is always present in the retort to assist in the destructive distillation of the light charge, in addition to the heat from the setting. This is what I understand to be an especial claim. I say 14 lbs. every 15 minutes or 56 lbs. every hour, but if 7 lbs. be dropped into the retort every two minutes or so, the same reasoning applies.

Now compare this with the ordinary charging in horizontals. Here 3 cwt. of coal is suddenly charged into a hot retort, and is gradually raised from about 50° to 2000°. When half the charge is burned off—it is bound to be a gradual process whether light or heavy charges are employed—the partly carbonized portion is assisted to carbonize by the heat of the portion that is completely carbonized.

What, then, is the advantage of the new process so far as heat units for carbonization are concerned? Surely 56 lbs. of coal carbonized every hour is only equivalent to 3 cwt. every six hours; and the heat units required to raise the temperature of a given weight of gas coal in six hours must be the same whatever the interval between the charges.

I notice that in the first article on the subject—entirely composed, as was stated, of extracts from the patent specification filed by Messrs. Settle and Padfield, and illustrations reproduced from the Patent Office drawings (see "JOURNAL" June 16, 1903)—all kinds of peculiar statements are made: That a retort in the ordinary process cools when drawn and so on (this sounds like an argument that an empty saucepan on the fire is cooler than a full one), and that coal is not completely carbonized by the ordinary process but each charge contains a core of uncarbonized coal. Coal is no longer solid when subjected to heat, but spongy; and the gas can pass freely away from it. When a core remains, it only goes to show that the charge has been too heavy for the retort, or the time has not been long enough—provided, of course, that the heat be good. People who are satisfied with 10,000 cubic feet of gas to the ton may waste coal; but we are not accustomed to have uncarbonized coal among our coke in this part of the country.

No particulars of the coke used per ton of coal carbonized have been given; and I also note that in the "JOURNAL" for Jan. 12, there would appear to be an error in giving the average of 110 tests of 2 cwt. each, the illuminating power as 14·56 candles. It seems to me that the average is just under 14 candles; for 110 tests of 2 cwt. each only represents the carbonizing of 11 tons of coal—not a very huge experiment to have called forth so many articles, figures and arguments! It would appear that all that has been written on the subject of the Settle-Padfield retort has been based on a make of 10,000 cubic feet per ton by the ordinary process instead of on 12,000 cubic feet.

Camerton coal yields when carbonized in a very moderate fashion 11,250 cubic feet to the ton; and if efficiently carbonized 12,000 cubic feet to the ton would in my opinion be obtained from it, together with 10 gallons of tar. If slack coal be carbonized in a suitable manner, *it will yield just as much gas as the screened coal.* Slack coal would, for obvious reasons, be only an advantage if it could be delivered on the works at a very low figure. It would not do to pay a big carriage on it. A demand for slack would put the price up.

It would be interesting to know whether the tests were made with a dry main or with a sealed main.

I do not follow the table "Losing Sperm Value," on p. 82 of the "JOURNAL" for Jan. 12.

To prove that there is nothing in the idea of small light charges and a quick evolution of gas, I again quote Mr. Hunt's test with charges of 4 tons, when 11,398 cubic feet of gas per ton from dry slack, 14 cwt. of coke, and 9 gallons of tar were obtained. Let it be compared with charges of 7 lbs. and a make of 13,000 cubic feet and no tar. Mr. Hunt's test was a comparatively rough one. But 210 tons of coal were tested; whereas the figures given respecting the Settle-Padfield retort are based on 11 tons of coal carbonized. The importance of this comparison cannot, to my mind, be over-estimated; and whatever the Settle-Padfield retort may do, it appears to me to have proved already the opening contention of this paragraph.

With regard to the validity of the patent, if the process be proved to be of value, they would be very mean people indeed who would not be prepared to pay a royalty for a licence to work it, apart from any other question.

The only claims that I can find there are in the process referred to that can be maintained—judging from the articles already published, taken in conjunction with common knowledge—are:

(1) The carbonizing of the tar. Nothing whatever is said about liquor.

(2) The constant quality of the gas given off from the retorts.

With regard to No. 1, it is a very questionable advantage; and with regard to No. 2, horizontal or inclined retorts have only to be charged at less intervals in order to produce an exactly similar result.

I can assure Mr. Humphrys that if he can point out to me any advantage in the Settle-Padfield system, he would find me one of its most ardent supporters; and it is only in my endeavours to seek its advantages that I have taken the trouble to make the remarks on the process that I have done. It is more necessary now than at any previous period to improve methods of gas manufacture, for reasons already detailed; but, of course, neither of us wishes to waste time and space by discussing in a technical journal facts that are already known.

In conclusion, may I express the hope that Mr. Humphrys will not find this article remarkable—for length?

The South Metropolitan Gas Coal Contracts.—The "Pall Mall Gazette" yesterday contained the following paragraph on this subject: "As usual at this time of year, the South Metropolitan Gas Company are placing their coal contracts for the ensuing twelve months, and negotiations are proceeding on the Newcastle Coal Exchange, and other North-country centres, for the purchase of the necessary supplies. A fair portion of the total was arranged for last week at an average of between 7s. 6d. and 7s. 9d. per ton f.o.b.—a reduction of about 6d. per ton. This is in accordance with our forecast in November last, and follows a concession of about 8d. per ton in May last year. The prices quoted above are for coal of middling quality. The contracts for superior grades will probably be concluded in a day or two. It is not anticipated, however, that the maximum of 7s. 9d. per ton, given above, will be much exceeded."

SOUTHERN DISTRICT GAS ASSOCIATION.

The Annual Meeting of the Association was held on Thursday, at the Hotel Cecil, Strand, W.C., and was attended by a considerable number of members. The outgoing PRESIDENT (Mr. J. TYSOE, of East Greenwich) was in the chair during the opening proceedings.

WELCOME HOME TO THE HON. SECRETARY.

The PRESIDENT said, before commencing the formal business of the meeting, he should like to be permitted to express on behalf of the members present, and he was sure those who were not present would also wish him to do so on their behalf, the pleasure they felt at the presence again of their Hon. Secretary, Mr. J. W. Helps. As they all knew, he had been travelling abroad for the benefit of his health; and he desired, in the name of the members, to congratulate him on his restoration to health, and to express the hope that he would be long spared to occupy the position he at present held very much to their advantage. (Applause).

The minutes of the autumn meeting having been taken as read,

The PRESIDENT called upon the Hon. Secretary to read the

ANNUAL REPORT OF THE COMMITTEE.

The HON. SECRETARY (Mr. J. W. Helps, of Croydon), before reading the report, asked leave to offer Mr. Tysoe his hearty thanks for the kind words he had spoken, and the members generally for the cordial welcome they had given him. He assured them it was a great delight to be among them again. The idea of returning home afforded him greater pleasure than he felt at the thought of going abroad. He was pleased to say the change and rest had done him much good; and he hoped, as Mr. Tysoe said, that he was now restored to health. He trusted that he had now the health and energy to carry on whatever duties he had in connection with the Association to better advantage than he had been able to do before. He then read the Committee's report, from which the following paragraphs are taken:—

The Committee have pleasure in presenting their twenty-ninth annual report of the progress of the Association during last year.

During the period under review, 17 names have been added to the roll of membership, 2 members have resigned, and 2 names have been removed under Rule 19. The Committee deeply regret to have to report the death of Mr. H. F. Packham, of Kingston-on-Thames, one of the original members of the Association, who was greatly respected by all who knew him.

The total number of members at the end of 1903 was 169, compared with 157 at the end of 1902.

[Here followed a review of the proceedings of the year.]

The Special Committee appointed to investigate the "Cause and Prevention of Naphthalene" have met a number of times during the year. It is already in the knowledge of the members that in the year the Committee appointed Dr. Colman to undertake an investigation at various gas-works with the object of ascertaining the cause of, and of devising a method for the prevention of, the deposition of naphthalene. Dr. Colman has given a considerable amount of time to this subject during the year, and has made a number of experiments to ascertain the conditions in the manufacture of gas which lead to the formation of naphthalene in the solid form. Short reports on the subject were made at the last two meetings held in London; but the Committee did not consider that the investigation had advanced sufficiently for a full report to be made. The Committee will present a further report at the meeting to be held on March 17, 1904.

The balance standing to the credit of the Association at the commencement of 1903 was £106 12s. 3d. The receipts during the year amounted to £82 19s., and the expenditure to £85 os. 11d.; leaving a sum of £104 10s. 4d. to carry forward.

The usual copies of the "Reports of Gas Associations" were presented to the members; and this absorbed a sum of £40.

The Committee feel that the best thanks of the members are due to the President and Hon. Secretary for their valuable services during the year.

Mr. W. D. CHILD (Romford) moved, and Mr. H. O. CARR (Wandsworth) seconded, the adoption of the report; and the motion was unanimously passed.

THE OUTGOING AND INCOMING PRESIDENTS.

The PRESIDENT said it now became his duty—he would not say pleasure, though it was in one sense a pleasure—to introduce to the members the President for the coming year. It was always sad to have to depart from a position of this kind, in which one had met with so much kindness. However, he had to do so; and he would do so with all the grace he could command. (Laughter.) He was glad to be in the position of introducing to the members a successor who would prove so able as his friend, Mr. Douglas Helps, of Reading. Mr. Helps was well known to all of them; and he was sure the expectations formed with regard to him and his year of office would not be disappointed.

Mr. D. H. HELPS (Reading), the new President, then took the chair, being very heartily welcomed by the members.

The PRESIDENT said his first duty was one of a very pleasing nature. It was to ask the members to pass a hearty vote of thanks to the late President for the able manner in which he had carried out the work of the office during the past year. They had to thank Mr. Tysoe not only for the most interesting address which he delivered to them last year, which address, he (the President) was certain, greatly enhanced the value of their records, but they had also to thank him for his kindness and hospitality when the members visited Greenwich.

Mr. W. E. PRICE (Hampton Wick), in seconding, said the members had had a most enjoyable year during the presidency of Mr. Tysoe. Though it was unfortunate he was away at the usual time for the summer meeting, the expectations which were kept in reserve increased; and when the meeting did take place, the pleasure was greater than even it would have been had the visit been in the summer.

The motion was carried by acclamation.

Mr. TYSOE, in responding, said he was extremely obliged to the members for their hearty acceptance of the kind words that had fallen from the mover and seconder of the proposition. He could assure them that it had been a pleasurable year to him in the office the members had been good enough to accord him. He, however, regretted that for a portion of the year he was absent; but he trusted that the real good of the Association did not suffer on that account. He did not think it did. During the year he had met with considerable kindness from all the members; and, as he had said before, he relinquished the position with a considerable amount of regret. Although removed from the office of President, he trusted that he should still be able in the future to be of some use to the Association—at all events, it would be his endeavour, whatever the position he occupied, to aid the purposes of the Association. He thanked them all very much for their kindness.

NEW MEMBERS.

The HON. SECRETARY then presented the nominations for membership. They were: Mr. R. S. Tobey, of Horley; Mr. H. Noel Clark, of Stratford, E.; and Mr. S. B. Chandley, of St. Mary Cray.

The PRESIDENT remarked that these proposals for membership had been considered by the Committee, who recommended the gentlemen named. He had much pleasure in proposing that they be elected *en bloc*.

Mr. J. ELDRIDGE (Oxford) seconded the proposition, which was unanimously carried.

The PRESIDENT then read his

INAUGURAL ADDRESS.

Allow me, in the first place, to thank you most sincerely for electing me to the responsible and honourable position in which I now find myself. I take the chair this afternoon with some misgiving. When I accepted the position of Vice-President, I was in charge of a works small by comparison with those I now have the honour to administer; and I, therefore, hoped before the time came to deliver a presidential address, to find ample time for the carrying out of certain experiments, the results of which might have proved of interest to you. Under the altered circumstances, this has been impossible; and I must therefore ask your kind consideration and generous forbearance.

I found on my appointment to Reading that, owing principally to the adoption of the slot-meter system, the consumption of gas was increasing at such a rate that it was necessary to make immediate preparations to meet the demand during the coming winter—the necessary extensions including the building of a new governor house and the re-arrangement of our distributing mains. Here, I may say that I am not one of those who believe in the old text-book maxim, "Keep down the pressure in the mains." Indeed, I regret that gas companies did not long ago recognize the fact that it is much cheaper to distribute gas at a higher pressure through comparatively small mains than through larger ones at a low pressure. It does not follow that increased leakage would result; for if the mains are badly laid in any town, a higher pressure will make it all the more easy to discover and remedy defects, and the sooner this is done, the better.

We, in this country, have been accustomed to distribute our gas at a pressure (so called) equal to from 2 to 6 inches of water. Now, what does this represent? Nothing more than 0·0722 to 0·2166 lb. pressure per square inch; whereas we know that our friends, the Americans, are charging their mains under a pressure of from 5 to 20 lbs. on the square inch in pipes of small diameter, and by this means keeping down their capital expenditure, while ensuring an adequate supply to their consumers. They, of course, use suitable governors to reduce the pressure at the consumers' premises. Why should we stand alone in distributing our commodity at such an absurdly low pressure, while water companies, hydraulic power companies, and compressed air and other companies, distribute theirs at pressures hundreds of times higher than is our practice? I am aware that several gas companies in England are using high-pressure mains to "back up" the supply in portions of their towns; and I think the day is not far distant when it will become general for all companies to send out gas at a very greatly increased pressure, and so save much expenditure which would be otherwise necessary in the enlargement of their mains, while at the same time they will put a stop to many of the

complaints of "bad gas" from the lower and outlying portions of their districts.

As I have previously said, my Company have only recently adopted the slot meter. Now, I am strongly in favour of this system; but I cannot forget that the slot consumer, like the poor, can always be found, and in supplying him with fittings, &c., we must see that this is not done—as I fear it sometimes is—at the expense of the ordinary consumer, who has, without doubt, so materially helped to build up our business. The extra charge made for gas supplied through the slot meter should not only be sufficient to pay interest on the extra capital employed in fitting up the houses, but also to provide an ample sum for the additional cost of collection from the meters, and for the writing-off of an annual amount of depreciation on the fittings, &c., in use. I cannot help remarking that, in my opinion, the clause lately introduced into some Bills, and known as the "Derby clause," is most unfair to gas companies, as it limits the extra sum which can be added to the ordinary rate per 1000 cubic feet to 10d.—an amount which, in some cases, is certainly not enough to cover the items I have mentioned.

I do not think gas companies have generally recognized that, in order to ensure the success of their concerns, the consumer should be given more attention than he has hitherto received at their hands. We ought not to wait for him to come to us with complaints or inquiries; we ought to go to him, and as far as possible prevent the cause for complaint, and provide, at the same time, useful and reliable information.

In many towns, electricians continue to distribute pamphlets containing most misleading statements as to the relative cost of lighting by means of gas and electricity. Many of these statements are nothing less than ridiculous; but, notwithstanding this, the ordinary public are sometimes misled by them. For one thing, our rivals seldom allow the incandescent gas-burner to enter into their calculations. In almost every case, the most modern of electric lamps are compared with what the electricians are pleased to call the "ordinary gas-burner." Are we doing all we can to hasten forward the day (which, by the way, I think is not far distant) when the old flat-flame burner will only be found in cellars and out-of-the-way places where very small and occasional lights are alone required? In the incandescent gas-burner, we have a light, not only infinitely cheaper, but also possessing many other advantages over the electric light. So long ago as the year 1900, it was stated that in Germany 90 per cent. of the gas used for lighting was consumed in incandescent burners, as compared with only 16 per cent in this country. But during the past few years a great change has doubtless taken place, which is largely due to the introduction of cheaper mantles and burners; and the incandescent gas system is rapidly extending, both for public and private lighting. We are, however, still far behind our Continental brethren in this respect.

The public require more education on this subject; and we must provide it in our show-rooms, by means of specially appointed representatives, through the Public Press, and by all other means in our power. In addition, I think that every gas company should now and again secure the services of a thoroughly skilled and competent lecturer to deliver an address on Welsbach's beautiful invention—the incandescent gas-burner. If the services of such a lecturer as many of us have listened to during the past ten years be obtained, and if the public can be induced to come and listen to him, then any expense and any trouble which may be incurred will be paid many-fold.

Gas is, next to sunlight, the cheapest form of light; and I do not think that there is—at any rate, in many towns—so much necessity on the score of competition with the electric light to reduce its price. The incandescent burner has—indirectly—done this to an enormous extent; and to reduce it any further will not tend to prevent those who are desirous of having the electric light from adopting it. But it is most desirable to reduce the price for heating, cooking, and (most important of all) for motive power.

With modern high-class gas-engines, coupled direct to dynamos, and with gas at (say) 2s. per 1000 cubic feet, electricity can be produced at from ¾d. to 1¼d. per unit, or including interest, depreciation charges, attendance, &c., for from 1¼d. to 1¾d. per unit, according to the size of the plant. There is, therefore, no reason why we should not retain all our large customers, and also obtain others as consumers of gas, even though they may desire to light their premises by means of electricity. Some customers might not care to go to the expense of purchasing engines and dynamos, in which case we should supply them on hire, just as we do fires or cooking stoves. Such consumers would probably use more gas than they would require in order to light their premises with incandescent burners; but the fact that they would obtain their current at a cheaper rate than they could purchase it from the local electric light works, affords a striking example of the economical advantage of gas over electricity.

In Reading, some 56 gas-engines are in use, principally during the daytime, for driving different kinds of machinery; their total capacity being equal to 387-horse power. Of these engines, 35, equal to 253-horse power, and supplied with gas through separate meters, consume on an average 42,372 cubic feet of gas per horse power per annum. A reduction in the price charged for gas used for motive power (in addition to any rebate allowed to large consumers), is not only most expedient, but can, in some cases, be justified in that, at the present time, most of such gas is consumed during the hours of daylight—thus helping to equalize the day and night consumption; and consequently to reduce the capital expenditure required per million cubic feet of gas made. This must, in the long run, tend to reduce the price of gas for all purposes.

It has been suggested that gas companies should lay down a dual system of mains—that is to say, one set for gas to be used for lighting purposes, and the other for the distribution of power gas. I do not think this will become the practice, at least in this country. What we must do is to use our utmost endeavours to induce Parliament to recognize that, with the introduction of the incandescent burner, gas of high candle power is not what the public require, but rather a gas which, being of sufficient calorific value for lighting, heating, cooking, ventilating, and motive power, can be produced at *one* works, distributed through *one* set of mains, and sold at the lowest possible cost per unit of energy.

I have little doubt that ere long many of the disabilities under which we at present suffer will be removed, and that we shall be permitted to supply such a gas as I have described. Surely we, as gas companies, are in a much better position than those who at present place all kinds of burdensome and unnecessary restrictions upon us, to know what our consumers or would-be consumers require; but, not only so, we are now able, if allowed, to supply them with the most economical quality of gas suitable for all or any of the purposes I have mentioned. And here I should like to add that the makers of gas-engines will, no doubt, welcome the day when gas of a more uniform calorific quality is supplied all over the country. A gas rich in complex hydrocarbons is not now necessary, either for the purpose of lighting or of providing motive power. Parliament should recognize that it is not only our desire, but to our interest, to supply a gas which, both as regards its quality and purity, will give the most general satisfaction and provide the cheapest form of energy for the public. I trust this point of view will be made quite clear to the Committee which has recently been appointed by the Board of Trade to inquire into and report on the quality, &c., of the gas supplied in London.

As gas engineers, we must, of course, pay every attention to the engineering side of our profession. We must scheme and invent, and take advantage of every invention which tends to cheapen the production of gas. But let us not forget the commercial side, the consumer and his education in all matters relating to the efficient and economical consumption of gas. A certain wealthy manufacturer of mustard once said that it was not the amount of that commodity which was eaten that made his fortune, but the quantity which was wasted. Let it not be said of us that our dividends are due to waste of gas on the lines of the following anecdote. I was told the other day that a large gas company received a complaint from a customer as to the excessive consumption of gas in his house. An inspector, who was sent to look into the matter, found all the burners in the cooking-stove alight; and on inquiring the reason, the cook replied: "Oh, that's how the man who fixed it some two months ago left it!" At the British Association meeting in September last, Sir B. Leach expressed the opinion that England was the most extravagant and wasteful country in the world. This statement applies with much force to the consumers of gas; and it should be our duty to prevent, as far as possible, waste of gas in cooking, heating, or lighting. By so doing, we shall strengthen our position and widen our field.

The engineer of a large gas company, with his many duties, cannot be expected to visit consumers, and to educate and instruct them in the best means of lighting their homes; but every gas company can, and should, employ a competent, intelligent, and (what is very important) patient representative to do so. Such a representative should make a special study of the most modern gas burners and fittings for private houses, public buildings, churches, shops, &c., and have a thorough knowledge of gas-engines. He should spend most, if not all, of his time in the district, advising both new and old consumers as to the most economical and artistic way in which their premises can be lighted and ventilated. He must also be fully competent to explain the difference between the manner in which gas is consumed in the flat-flame as compared with the incandescent burner, and so make it clear to consumers that, by adopting the latter in place of the former, they can obtain light in the cheapest possible way, while at the same time the amount of oxygen consumed by, and the quantity of the product of combustion given off from, the flame are very greatly reduced.

Now that so many ironmongers, as well as plumbers, &c., are prepared to undertake the fitting up of buildings with the electric light, it is most important that such an official as I have sketched should be employed to advise the public, and combat the efforts of the electricians. It is often claimed that the electric light is much more convenient than gas light, as it can be switched on and off from any suitable position. This claim can now no longer be made. By means of the Telephos arrangement, Bartlett's patent igniter, or the clever pneumatic invention of M. Gustav Weinmann, gas-burners, either singly or in groups, can be switched on or off nearly, if not quite, as easily as can the electric light. This is another point which the district superintendent should make known to consumers.

The question as to whether gas companies should or should not undertake the fitting up of houses with piping, gas-brackets, &c. is daily becoming of more importance. In some towns, it is

impossible to obtain up-to-date and artistic gas-fittings from local tradesmen; and only a short time ago a local firm wrote to me to say that they would have to advise their customers to adopt the electric light if my Company continued to undertake internal fitting work. I pointed out to this particular firm that the heading on their business paper stated that they supplied and fitted hot-water and electrical apparatus, but did not mention the word gas.

I fear lest I may have wearied you with much of the foregoing; but, seeing that so many of the general public are so woefully ignorant of the great advantages of the incandescent burner, and some of them inclined for purely sentimental reasons to adopt the electric light, I feel I cannot overrate the importance of all possible steps being taken to teach them the truth—even if so doing results in our having less time to spend on the discussion of such subjects as the relative advantages of inclined and horizontal retorts.

During the past year, the question of improvements in street lighting has been very much in evidence in many parts of the country; and it is gratifying to find that gas has more than held its own for this purpose, as has been shown by the interesting statistics recently published in the "JOURNAL OF GAS LIGHTING." Local authorities now recognize that, not only is the incandescent gas-burner much cheaper, but it is just as efficient as the electric arc light for the lighting of streets and open places. In this connection, my Company have recently had very keen competition with the local Electric Lighting Company. Both Companies were asked to furnish schemes and estimates for the improved lighting of the streets, including the tram routes, and also to instal a number of experimental lamps in one of the thoroughfares. This was done, with the result that my Company obtained the order to light the whole of the borough with incandescent burners. As under the old system all the streets—with one or two slight exceptions—were lighted by means of flat-flame burners placed very far apart, and regulated to consume on an average only 3½ cubic feet of gas per hour, the change to the more modern method, with the addition of a number of new lamps, will considerably increase the lighting rate; but notwithstanding this, my Company's tender was for the tram routes alone some £1200 per annum cheaper than that of the Electric Lighting Company. If, then, we are able to beat the electrician's arc, surely we should have no difficulty in more than holding our own against the much more expensive electric incandescent lamp.

It must not be thought that, because I have several times referred to the rival light, I have any fear that it will seriously interfere with our industry. I do not think it will affect us more in the future than it has in the past. There are signs that we shall ere long still further widen the great difference which already exists in the cost of the two systems of lighting; and that there is (to make a "bull") more history in front of our industry than behind it—an industry representing in this country alone a capital of over £115,000,000.

So much for the commercial side of our profession, I now turn to the works. During the past year, distinct advances have been made in stoking machinery, and less has been heard of inclined retorts. It may be, however, that to the advent of the inclined system we owe the successful introduction of West's combined charging and drawing machinery, and possibly such inventions as the coal-projector and the Settle-Padfield vertical retort. West's combined machinery can be used in works which were hitherto much too small to employ power for stoking; and it will be found to reduce the cost of carbonizing wages in such works to a very large extent. The simplicity of the coal-projector appears to have charmed all who have seen it. The machine is doing splendid work at Derby; and Mr. J. Ferguson Bell (to whom many engineers owe their thanks for his kindness when visiting his works) is certainly to be congratulated on being the first to employ it in this country.

I sometimes wonder why the value of the gas produced per ton of coal, calculated in sperm value, should vary so greatly in different works using practically the same quality of coal; and I can only assume that much waste is going on, especially in many of the small and medium sized works in this country. If I am right, this is doubtless principally owing to improper working in the carbonizing department. In some small works, this is, perhaps, due to want of knowledge on the part of those in charge), but more often to the fact that the manager's time is so taken up with clerical and other work—which might well be performed by a clerk—that he is unable to devote sufficient attention to the supervision of more important matters. If Directors will only recognize that, even in small works, it is necessary to place someone in charge who has more technical knowledge than is generally possessed by what is known as the "Working Manager," they will be well recouped for the extra amount spent in obtaining such assistance. Again, how often is it the case that, in works of a fair size even, reasonable assistance is denied, with the result that not only do the working results suffer, but the engineer has little time to devote to the commercial side of his profession in the way of advising consumers, and of combating the efforts of his better paid and generally better assisted rival—the electrical engineer. I am aware that there are works so small that only one or two men are required to do all that is necessary. In such cases, it is important that the owners should arrange with a skilled gas engineer to pay occasional visits, to see that the undertakings are being conducted on modern and economical lines.

But to revert to the question of carbonization. At the risk of being considered pedantic, I ask: "Are we in our larger works obtaining the best possible results from our coals?" I mean, the best possible results which can be obtained with modern retorts and furnaces. I hardly think so; and, to my mind, the fault lies to a very large extent in the hydraulic main and in the irregularity of the depths of dip-pipe seals.

In many works, even if the top of the hydraulic main is occasionally levelled up, the actual seals are seldom compared with one another; and it is quite possible, while having the hydraulic level, to have the dips unequal. Not only should the seal be periodically "dipped," but the actual condition as to pressure of gas in the retorts should be ascertained by means of a small portable gauge attached to the lids. If the seals are kept level, not only will there be a much larger yield of good-quality gas per ton of coal, but where lime is used for purification much less of this material will be required and sulphur purification will present fewer difficulties than it frequently does, owing to the absence of furnace gases, excess of oxygen, &c. Again, it is probable that where careful attention is not given to this point, difficulty may be found in separating the water from the tar, as the small particles of carbon carried forward become coated or saturated with water, and are held in suspension in the tar.

I am quite aware that the facts which I have mentioned above have long been known to us; but do we all pay sufficient attention to them and to other apparently "next-to-nothings" which help to produce cheap gas, and to bring about the largest possible sale of it? I think not; otherwise the results obtained by various companies (many of them using similar coals) would not differ so much as they do. Let us endeavour to bring the results we obtain from our coal in the retort-house nearer to those secured in the laboratory. From what we are told, this has been done with the Settle-Padfield vertical retort. There is little doubt that, if the time hitherto considered necessary for the carbonization of coal can be reduced, the nearer the results obtained will approximate to those that are given by the small experimental retort. Mr. W. H. Y. Webber has recognized this, and the outcome is his system of small multitubular horizontal retorts. Difficulty has hitherto been experienced in charging and drawing retorts of small diameter; but it has been suggested that the coal-projector for charging, and the patent ram for removing the coke, will overcome these difficulties. In fact, I have been told on good authority that the coal-projector would be capable of placing a level charge of coal into a retort of 10 inches diameter or less; and if this is so, the ram would have less difficulty in dealing with the coke than in the case of retorts of larger size.

The Reading Gas-Works are provided with a complete coal-testing plant; and I think that the exceptionally good results which have always been obtained there are largely due to this fact, which has enabled my Company to select, not necessarily the best coal, but the cheapest when its value is calculated in pounds of sperm. There is little doubt that, in the future, the calorimeter will occupy a more important place in gas-testing than it has done in the past; and it will then be even more important for gas companies to possess a coal-testing apparatus. I hope in the near future to carry out some experiments as to the heating values of gas derived from different classes of coals.

Let our aim be to raise the gas industry and the profession of the gas engineer to a higher scientific level. This can only be done by the employment of properly trained and duly qualified gas engineers. Directors of gas companies are now, I believe, beginning to recognize the economy resulting from such a course, and, in addition to this, of granting their engineer such adequate technical and clerical assistance as will enable him to devote sufficient time and attention to the many important sides of his complex profession. But such cases are by no means general; and, in consequence, the industry as a whole, and especially in its competition with the electric light, suffers, and will continue to suffer. In many towns, the salary offered to the gas engineer is so ridiculously inadequate that the right man is not attracted. Again, I have often noticed the care which some Directors of small companies will give to the question of the appointment of a junior clerk at (say) from £30 to £50 per annum in an office which has been much overworked; while all the time, it may be, there are several workmen employed at £60 to £80 a year each, whose services might well be dispensed with, if a qualified manager were in charge.

Compared with a period of twenty, or even ten, years ago, there is now so much more demanded, or should be demanded, of a gas engineer, that it behoves those who are in authority to offer such an inducement, not only in the way of payment, but also of general treatment, as will attract to their service men thoroughly competent to administer the many sides of our profession. A great poet has written:—

"I know
How far high failure overtops
The bounds of low success."

But has this been recognized by Directors, and by members of corporation gas committees? If those in authority will but obtain the right men, and, having obtained them, grant them adequate assistance and more license to experiment and to carry out their ideas, the comparatively small extra cost in the way of salaries will bear fruit a hundredfold.

In this connection I should much like to quote an extract from

Sutherland's "Twentieth Century Inventions—A Forecast." In the chapter on "Invention and Collectivism," he says:—

It is plain that those economic forces which prevent the inventor from having his ideas tested must to that extent retard the progress of industrial improvement. The average official naturally wishes to retain his billet. That is the main motive which governs all his official acts, and in the treatment which he usually accords to the inventor he shows this anxiety perhaps more clearly than in any other class of the actions of his administration. He wants to make no mistakes; but whether he ever scores a distinct and decided success, is comparatively a matter of indifference to him. So long as he does not give a handle to his enemies to be used against him, he is fairly contented to go on from year to year in a humdrum style. Even a man of fine feeling and progressive ideas soon experiences the numbing effects of the routine life, after he has been a few years in office. He knows that he will be judged rather on the negative than on the positive principle—that is to say, for the things which it is accounted he ought not to have done, rather than for the more enterprising good things which it is admitted he may have done.

Now, anyone who undertakes to encourage invention must necessarily make mistakes. He may, indeed, know that one case of brilliant success will make up for half-a-dozen comparative failures; but he reckons that at any rate the blanks in the chances which he is taking will numerically exceed the prizes. An official, however, will not dare to draw blanks. Better for him to draw nothing at all. He must, therefore, turn his back upon the inventor, and approve of nothing which has not been shown to be a great success elsewhere. This means that the socialized and municipalized enterprises must always lag behind those depending upon private effort, and the country which imposes such disabilities on the latter must, for a time at least, lose its lead in the industrial race.

Before concluding this address, I should like to refer to the progress which the Association has made during the past year in connection with the inquiry instituted into the causes of the formation and the deposition of naphthalene. Even at the time of writing I think that, with the able assistance of Dr. Colman, good and substantial progress has been made, and that the tests which have been carried out have so added to our knowledge of this most troublous compound that we may hope to hear ere long of a large diminution of the difficulties caused by it. Your Committee are, I believe, presenting an interim report on the subject. The great difficulty which has had to be dealt with lies in the fact that, in most works, large quantities of naphthalene have collected in the mains on the works or in the district, or in both. Consequently, it takes a very long time to determine the effect of any experiment which may be made to rob the gas of its naphthalene, as when this has been accomplished the gas again becomes saturated with the compound in its passage through the mains; and it must be remembered that a cubic foot of naphthalene crystals, while occupying a very large amount of space, weighs only ¼ oz. The hydrocarbons which exist in coal gas form a most complex mixture, having varying boiling-points; and there is little doubt that the reason for the trouble in some cases is due not so much to there being an excessive quantity of naphthalene in the gas, but to the scarcity of those other hydrocarbons possessing boiling-points near to that of naphthalene.

Again, in some works the introduction of carburetted water gas has caused a large diminution of the trouble; whereas in others in which it has been adopted no improvement has taken place. This is probably due to the same cause—viz., that, owing to the variations in the heats employed in "cracking" up the oil or in the quality of the latter in the first place, a smaller amount of hydrocarbons having high boiling-points are produced to condense and hold in solution the naphthalene whenever the gas is reduced in temperature in the district mains and service-pipes. Our object should be to increase, naturally or otherwise, the percentage of those vapours having vapour tensions analagous to that of naphthalene.

I am aware that, when we commenced this inquiry, there were some who thought that our task would prove a hopeless one, and that no solution of the difficulty, short of going back to the old days of "low heats," would be found (and even this might not solve the difficulty); while there were others who, having no trouble with naphthalene, thought that they had, by certain alterations in their plant, discovered a panacea for the trouble, rendering further inquiry unnecessary. In fact, I know of a gentleman connected with gas-works who, when his company were asked to contribute to the research fund, said: "Why should we tell our secrets to others; brewers do not do so." This gentleman was not far-seeing enough to recognize that the inconvenience and annoyance caused by naphthalene in some towns acts prejudicially, in the long run, to the cause of gas lighting in other districts where no trouble may be found. It will be a great triumph for this Association if a cure should be discovered. But even if such a result be not forthcoming, the addition made to the general knowledge of this strange compound will well repay those interested for the time and money which have been devoted to the research; for has it not been said that "the worth of a man lies not in the knowledge he possesses, or thinks he possesses, but in the honest endeavour he puts forth to possess the truth, for not by the possession of, but by the ever seeking after of truth are the faculties of man enlarged?"

The Prime Minister, presiding at the first annual meeting of the Committee of the Cancer Research Fund in July last said:

I am aware that Sir William Broadbent is not exaggerating when he says that not merely large numbers of the public, but large numbers of the medical profession also, seem to think that the time, money, and labour necessary to be expended before any adequate results are attained, are in all probability likely to be thrown away. I cannot agree, and I am sure that we ought not to agree, to any prophecies so pessimistic and so discouraging. As problems that seemed insoluble in 1800 are now matters of daily experience, so in the course of a few years we may, perhaps, look back upon our present state of knowledge, and not only congratulate ourselves upon the progress that has been made, but wonder that anybody had so little faith as to doubt that such progress was possible.

Gentlemen, I sincerely trust the time is near at hand when we shall know more of those apparently next-to-nothings which cause naphthalene in one district to be an ever-present source of trouble, and in another district to be absent in the solid form both on the works and in the district mains.

Before commencing its inquiry into the naphthalene trouble, the Association sent a circular-letter to the companies in our district, asking them to contribute something towards its cost. Many of them agreed to do so, but others sent no help. May I ask those who adopted the latter course to reconsider their decision? The great importance of scientific research work has not yet been fully recognized in this country, and many industries have in consequence suffered. Take the case of the transfer from England to Germany of the manufacture of aniline dyes, and many other valuable products from the coal tar we produce. The original investigations and discoveries were made in England, and for some years—from 1858 to 1872—we made more coal-tar colours than any other country. How changed are the conditions at the present time! We now find that the Germans in their laboratories have so perfected and cheapened the production of these dyes, that they buy much of our crude tar, and export coal-tar products valued at £4,000,000 annually, one-fourth of which comes to the United Kingdom.

Compared with Germany and America, we are wofully deficient in institutions providing advanced technological training. There are certainly signs of improvement in this respect; but the day is, no doubt, far distant when any such public institutions will be willing to take up such an investigation as the one we have recently undertaken; and again it is a question whether such work should be left to a District Association. Such research work should, in my opinion, be undertaken by the parent body, the Institution of Gas Engineers. If the Institution can be persuaded to start an independent research fund, I have little doubt that nearly all the gas companies in the United Kingdom would be willing to contribute a small annual subscription to it. The services of a highly-trained Chemist could then be retained, and a small Sub-Committee appointed to administer the fund, and decide the nature and extent of any investigations to be made at works where any difficulty or subject of interest might arise. Such a fund would help us all to produce and supply gas in the cheapest possible way, and our consumers to consume it in the most scientific and economical manner, and so strengthen us in our competition with rival illuminants. If such a fund as I and others before me have sketched out is formed, it would not only be the duty of all gas companies to subscribe towards it, but also very much to their advantage to do so. It has been said that if research work be undertaken by the Institution it will tend to lessen individual inquiry. But surely this would not be the case. The engineer of a works may often have some original idea which he wishes to test or to investigate; but, owing to the lack of time, of apparatus, or of chemical knowledge, he is unable to do so. In such a case, he could, if the fund existed, go to the Institution for help and advice.

Mr. S. Y. Shoubridge (Sydenham) observed that it was his pleasant duty to propose that the best thanks of the members be given to the President for his address. They all knew the great difficulty there was at the present time in finding subject-matter for a presidential address; but he thought the members would agree that the President had succeeded admirably in presenting a most thoughtful and interesting one, and one which was sure to be productive of much benefit to all the members.

Mr. T. May, jun. (Richmond), in seconding the motion, said the President had indeed given them a lot of food for thought in his address, which would bear their quiet reconsideration. He was sure that from the address they would derive great benefit. As one who had known Mr. Helps from the time he went to Croydon, and had seen him go up in the profession to the position he now occupied, he begged to congratulate him, and, at the same time, the Association on having such an able President.

The proposition was cordially agreed to.

The President, in reply, thanked the members very much for the kind way in which they had expressed their approval of his address. He could assure them, however, that he was not at all satisfied with it. It was no easy matter to write an address in these days, when the technical journals, directly they heard of anything that offered something new, sent somebody to report upon it. Every year it became more difficult to write an address; and he must say that in his opinion there were too many addresses.

A FURTHER REPORT ON THE NAPHTHALENE INQUIRY.

The President said the next matter for consideration was the report of the Naphthalene Committee. It had been sent to all the members; but he did not know whether it was their feeling

that it should be taken as read. No doubt some kind of discussion would take place on the report; but he thought it would be wise for it to take rather the line of suggestions to the Sub-Committee as to future investigation, than for them to go thoroughly into the naphthalene question, because it was such a big one, and they could all say so much about it.

The report, which was taken as read, is as follows:

CHEMICAL LABORATORY,
1, ARUNDEL STREET, STRAND, W.C.,
Feb. 29, 1904.

To the Naphthalene Sub-Committee,
Southern District Association of Gas Managers.

Gentlemen,—I beg herewith to submit my report upon the work done since May of last year in connection with the naphthalene inquiry.

The ultimate object which has been held in view throughout the investigation has been the acquirement of as full a knowledge as possible of the varying conditions under which condensation takes place, and the determination of the factors most favourable to the complete elimination of naphthalene from the gas, or, if such complete removal should be found impracticable, to ascertain how the quantity may be reduced to a low limit, and at the same time to ensure the presence in the gas of such a quantity of vapours of liquid solvents for naphthalene as to prevent the latter separating in the *solid* form, either in the subsequent manufacturing plant or during distribution.

In order to attain this object, six works were selected, at three of which (termed A, B, and C) no trouble is experienced from naphthalene, and three (termed D, E, and F) in which much separation of the hydrocarbon occurs, either on the works or in the district, or in both. At D, the trouble is mainly in the district; at E, it occurs both on the works and in the district—being most troublesome in the latter; while at F, the stoppages on the works are more serious than in the district.

Examination has been made, at each of these works, of the general conditions of carbonization and condensation of the coal gas, and many determinations have been made of the quantity of naphthalene in the gas, and also of the nature and amount of the vapours of other substances present along with the naphthalene in the gas. Investigation has also been made of the composition of the coal tar being made at each works, more particularly in relation to the amount of light oils contained in such tar; and where carburetted water gas is made, similar tests have been, or are being, made of the gas and tar produced by that plant. In addition to this, experimental work is being carried on at some of the works to determine the effect on the naphthalene of specially modifying the conditions prevailing in the condensers.

The results so far obtained are not sufficient to enable detailed conclusions to be drawn with absolute certainty; and it will surprise no one who has studied the subject to find that the results of the observations at the different works appear in many cases to lead to contradictory conclusions. In view of the very varying changes which take place in the condensation of such a complex substance as coal tar, such apparent contradictions are certain to be met at first; and these can only be cleared up by continued investigation. At the same time, the results obtained seem to justify certain general conclusions.

In the first place, with regard to the quantity of naphthalene present in the gas during the summer and autumn, the results at each of the works are given in Table I. It is at once noticeable that the freedom from naphthalene trouble in works A, B, and C is by no means due to the absence of naphthalene from the gas, as in many cases the amount found is as high as, or even higher than, in the works which are seriously troubled.

The quantity of naphthalene in the gas at these works during the winter months shows very curious variations. Taking first the works where no trouble is experienced, it has been found that the gas at A and B still contains the hydrocarbon in considerable quantity, while the gas at C is practically free. Of the works where naphthalene trouble exists, this is still present in the gas at D, whereas at E and F it has practically disappeared. At present, no evidence is available which affords any explanation of these remarkable results.

The determination of the amount of vapours of "light oils" present in the gas along with the naphthalene, and also of the percentage of such oils present in the tar at each works, shows, however, a marked difference in the two sets of works. The results of these determinations are given in Table IIA and IIB. It will be seen that, in the main, the quantity of these substances, both as vapour in the gas and as liquid in the tar, is decidedly higher at the works free from naphthalene deposits than at the others—this being especially the case with regard to the xylene fraction boiling between 130° and 170°. The total quantity of such oils produced during carbonization must be higher at the first-named works; and the conclusion may therefore be drawn, with a fair degree of probability, that this is one factor in bringing about the immunity from stoppages. With a larger production of these substances, the effect would be either: (1) A more complete removal of the naphthalene in the condensers, or (2) the retention of a larger quantity of the light oils as vapour in the gas. In the case of works B and C, in particular, it would seem that the better result is due to the second of these causes—thus confirming the views of Messrs. Young and Glover, Eitner, and others, as to the value of the presence of such vapours in preventing the subsequent deposition in the solid state of naphthalene; the latter, if deposited at all, then coming down as a solution in the light oils simultaneously condensed, and falling to the syphons without causing further inconvenience. It may be mentioned here that a sample of oil condensed in the syphons on the district supplied from works C contained over 12 per cent. of naphthalene.

It does not, however, follow that the quantity of light oils found in the case of the works A, B, and C would in all cases prevent the naphthalene deposits from forming. Apart from this, the amount of naphthalene and the nature and quantity of the other substances present in the tar, as well as the exact conditions of condensation, will have an effect; and many cases are known in which the deposition occurs to a serious extent even when the quantity of light oils produced is higher than at A, B, or C.

In Table IIB, the source of the coals carbonized and the approximate make of gas per ton of coal is given for each works; and from these it appears that the amount of light oils produced is not solely dependent on either of these points. Thus the highest and lowest figures are obtained at works using nothing but Durham coals; and the works showing the smallest yield of light oils is also the one making the least gas per ton.

So far as they go therefore, these tests seem to confirm the view that, by carrying out the condensation of the gas in such a manner as to have as much light oils as possible at the cold end of the condenser (where the great bulk of the naphthalene has been removed from the gas by mere cooling), it should be possible to ensure that the gas will no longer deposit solid naphthalene later on under any ordinary conditions met with in practice. Experimental work has, therefore, been carried out at two works with the object of bringing about such conditions; and although these tests are not yet completed, they give promise of yielding valuable conclusions.

At works F, a quantity of light oil (crude xylene) was introduced into the condenser, near the outlet, by special means; and the effect on the naphthalene was examined. After some preliminary trials, it was found that by the addition of a quantity equal to about 5 gallons per million cubic feet, the naphthalene was almost completely removed from the gas in the condenser, although the gas was not cooled below 80° Fahr. at the condenser outlet; whereas previously the gas contained about 18 grains of naphthalene per 100 cubic feet. It was further shown that, when the addition of the light oils was stopped, the naphthalene reappeared in the gas, and disappeared again on their reintroduction. These results appeared most encouraging; but after a short time, the effect became less, and some 3 to 4 grains of naphthalene were left in the gas, and this amount gradually increased during the autumn, as the daily production of gas was augmented. Many modifications were made to try and get results previously observed, but without success. With the arrival of winter, however, the naphthalene again disappeared from the gas; but this was no longer due to the action of the light oils added, as the gas was still practically free from naphthalene when the supply of these was shut off. The experiments have, therefore, been for the present discontinued, but will be resumed when the naphthalene reappears in the gas.

In this connection, mention may be made of one of the difficulties of investigation—namely, that there is so much naphthalene deposited in the apparatus and mains on the works that even when the naphthalene is completely removed in the condensers, the gas picks up the hydrocarbon from these deposits, and may contain considerable quantities when it goes out into the district. Where such deposits exist, some time will elapse before relief is felt in the district.

In these particular experiments, it was found that while the gas leaving the condensers contained practically no naphthalene, it had taken up 12 grains per 100 cubic feet by the time it had reached the purifier outlet. That this naphthalene was actually obtained from the deposits in the mains, was shown by the fact that at this time the back-pressure thrown by the scrubbers, &c., materially decreased, in spite of an increase in the make of gas per diem.

At works C, experiments were carried out on different lines. The method adopted in this case was to remove from the hot gas at the condenser inlet the heavy tar-fog carried along mechanically with the gas. When this is effected, the tars which separate out during the cooling of the gas from 130° to atmospheric temperature, are kept free from admixture with the heavy tars previously condensed, and which already contain much naphthalene. The object of the experiment was, therefore, to ascertain the effect of this procedure upon the removal of naphthalene.

So far as the actual separation of the heavy tar-fog is concerned, the experiments have proved quite successful, as, by means of a centrifugal tar-separator, it has been found possible to separate the tar particles simply, cheaply, and effectively. At this particular works, the amount of tar present as fog in the gas at the condenser inlet is found to be about 3 gallons per ton of coal carbonized, or nearly one-third of the total tar production; and when the separator is at work, the amount of tar separating subsequently in the condenser is about one-third of a gallon per ton of coal—the great bulk of the product from the condenser consisting then of ammoniacal liquor. The condenser tar obtained is in this case a thin liquid resembling oil-gas tar in appearance, and, as would be expected, is much richer in low-boiling constituents than the average tar.

The effect of the alteration on the naphthalene removal cannot

as yet be definitely stated. Tests made after the separator was put to work showed that only very small quantities of naphthalene were left in the gas; but by the time the apparatus was erected, winter had set in. When the separator was bye-passed, and only the ordinary conditions prevailing, the amount of naphthalene in the gas is likewise very low—just as had been found at works F. The determination of this point, therefore, has also to be left until the naphthalene reappears in the gas at the condenser outlet, which will probably be the case when the atmospheric temperature rises.

As time has permitted, examination also has been made of the carburetted water gas at the four of the above works at which it is made; but these are as yet only partially completed. Sufficient has been done, however, to show that in some cases the carburetted water gas contains as much naphthalene as the coal gas, but that, on the other hand, it always contains a much higher quantity of vapours of light oils, although this last amount varies much at different works. The tar obtained from the oil in this plant contains, as is well known, a vastly greater proportion of such light oils than coal tar. The results obtained with the oil tar are given in Table III.

In the case of works having a carburetted water-gas plant, it would appear likely that this tar would prove the best source for obtaining light oil to add in the coal-gas condensers, if it should prove that this is necessary and advisable.

In conclusion, I have to express my great indebtedness to the Engineers and others at all the above works, for their hearty co-operation in the work of this investigation. In addition, I have also to express my thanks to Mr. J. Ferguson Bell, of Derby, Mr. A. Colson, of Leicester, Mr. Harold Copp, of West Bromwich, and Mr. J. W. Morrison, of Sheffield, for the kind manner in which they have freely placed at my disposal any information and results they had themselves obtained on the subject.

(Signed) HAROLD G. COLMAN.

TABLE I.—*Tests for Naphthalene in Coal Gas at Different Works.*

[Results given in grains per 100 cubic feet.]

Works.	Maximum.	Minimum.	Average.
A	10·9	3·4	6·6
B	16·8	10·4	13·7
C	17·3	3·1	10·4
D	13·6	4·1	7·5
E	15·0	6·2	11·0
F	20·9	16·9	18·3

TABLE IIA.—*Vapours of "Light Oils" in Coal Gas at Different Works.*

[Results given in cubic centimetres per 100 cubic feet.*]

Works.	Oils Distilling up to 170° C.	Oils Distilling between 130° and 170° C.
A	9·6	6 0
B	14 0	5·0
C	14·7	7·2
D	7·6	3·2
E	12·1	4·6
F	13·9	4·4

* Owing to the different specific gravities of the oils having different boiling-points, the *weight* of the fractions cannot be given exactly; but this may be found approximately by taking 1 c.c. as 14 grains.

TABLE IIB.—*Determination of "Light Oils" in Coal Tar from Different Works.*

[Results given in cubic centimetres per pound of tar.]

Works.	Distilling up to 170° C.	Distilling between 130° and 170°C.	Class of Coals Carbonized.	Approximate Make of Gas per Ton.
A	8·2	3·6	Durham only	11,250
B	10·4	3·7	,, ,,	10,800
C	7·6	3·8	2/3 Durham, 1/3 S. Yorks.	10,520
D	7·3	2·6	N. Wales and Midland	11,700
E	5·7	2·6	Durham only	10,600
F	4·4	2·5	,, ,,	10,050

TABLE III.—*Determination of "Light Oils" in Carburetted Water Gas Tar from Different Works.*

[Results given in cubic centimetres per pound of tar.]

Works.	Distilling up to 170° C.	Distilling between 130° and 1700 C.
A	54·6	29·8
B	27·6	19·8
C	55·3	22·5
E	56·1	33·7

Discussion.

The PRESIDENT remarked that he might say the report had received the careful consideration of the Sub-Committee who had the matter in hand; and he would ask Mr. Price, the Chairman of the Committee, to open the discussion.

Mr. W. E. PRICE (Hampton Wick) said the report had been presented at the present time with the object that the Association, as a whole, should see what had been done, what the Sub-Committee were doing, and how far the inquiry had gone. By no means was the report brought up with the idea of giving the members the impression that the Sub-Committee had done a great deal, or had got to what they considered was the end of their work. Far from that. But seeing that it was now (he was speaking off-hand) something like eighteen months since the Committee were first appointed and met over the matter, they thought the Association would certainly wish to hear what had been done. Further than this, the inquiry had not been conducted without expense; and, although each member of the Sub-Committee and of the General Committee hoped the inquiry would continue, this could not be done unless further contributions to the funds were made. They therefore thought it was only reasonable that before they asked for more funds, some sort of statement as to what had been accomplished should be made. The points were, he thought, very clearly put forward in the tables at the end of the report. As the President had suggested that any discussion on the report that day should be directed more to asking questions on any points that might arise in the minds of members, or making suggestions to the Committee, rather than going into the general question of naphthalene and its cure, he would not digress. He did not think there were any points upon which he desired to raise any question. The tables at the end of the report showed very clearly what had been done, and bore out very much the opinions of some at least with reference to naphthalene. At any rate, one thing could be concluded by anyone reading the report, that the solution of the naphthalene difficulty was not yet in the hands of the Committee. The unfortunate (unfortunate for the inquiry) part about it was that, at the works where the experiments had taken place, naphthalene had, generally speaking, disappeared at the present time. Therefore experiments that were taking place in the summer when naphthalene was very high had had to cease, simply because there had been no naphthalene with which to deal. If any member could give the Sub-Committee any suggestion or help in any way, they would welcome it with pleasure.

Mr. A. F. BROWNE (Vauxhall) said as it was contemplated that there should be some amount of discussion on this subject, and as suggestions had been invited, he should like to give expression to one or two ideas that had occurred to his mind. First of all he must congratulate themselves, as an Association, upon the record of very good work that had been done under the superintendence of the Naphthalene Committee. He thought they must also compliment Dr. Colman upon the results of his labour. When they reflected that only nine months had elapsed since he began, he (Mr. Browne) thought they must all agree that the amount of work that had been done in so short a time was really remarkable. Those of the members who had taken some especial interest in the naphthalene question knew what a wearisome labour it was, and how the experiences of one day were contradicted by those of the next. Now as they might have expected from a man of Dr. Colman's scientific training, all that was set down in his report was a simple, unvarnished tale of the results of his investigations. Already, it seemed to him (Mr. Browne) Dr. Colman had managed to convey to them some new knowledge; but that was, in a great measure, discounted by the disappointment which had occurred to him (as to others) that, as the seasons changed, and the circumstances altered, what had appeared at one time to be proved as at least true turned about very much indeed subsequently. If he might venture to make a suggestion to Dr. Colman, it was this: In reading his interesting report, he noticed that the Doctor, in one or two places, spoke of summer, autumn, and winter. He had not yet been able to carry his experiments through the spring. Well now, the vagaries of our climate were such that really the terms "summer, autumn, and winter" did not convey anything very definite to their minds; and he believed what Dr. Colman really wished to convey to them, in using these terms, were the periods of maximum and minimum consumptions, and the two intervening means of consumption in the spring and the autumn. He respectfully suggested to him that, if this was so, it would make it somewhat easier for them if this were stated, and if he would drop the terms of the seasons. This brought him to another point. There were some towns—notably seaside and health resorts—where the period of maximum consumption was that of the summer (owing to the great influx of visitors) and the minimum in the winter. It appeared to him that, if the Doctor could place himself in communication with such a town or towns, the result might be some further puzzling illustrations of the behaviour of naphthalene. If it were really, as he (Mr. Browne) said, periods of maximum, minimum, and mean consumptions with which they had to deal, he thought it led them rather away from the consideration of the question of temperature to considerations of speed and friction. He had with him a statement of the average temperature for the three months of last summer. It was 58°. In the three autumn months, it was 53¼°—very little difference; whereas in the three winter months, it dropped to 40·7°. So that really there was a difference of about 18° between the averages of summer and winter.

Mr. MAY: Was that the temperature of the air?

Mr. BROWNE replied in the affirmative. Continuing, he said he thought from what Dr. Colman had himself said in regard to this subject, that speed and friction had a very great influence indeed upon the amount of naphthalene found; and therefore he (Mr. Browne) suggested, if it were possible to find a works where

he summer make was the maximum, it might be of value. There was one other suggestion he should like to make. It was this: They had undertaken a very large and important inquiry, which might have to run a long time; and one was disposed to think that the Doctor was proceeding on a scientific method, and was accumulating a vast amount of facts, from which he might make a great induction, but he might have to wait for it. It appeared, however, to him (Mr. Browne) that the members of the Association were not doing all they could to help him. Dr. Colman did not expect to solve this thing off his own bat. He was fortunately a specialist *ad hoc*. He knew what gas-works were, and what naphthalene was; and his labours were likely to be much more fruitful than those of any scientific man, however brilliant. This being so, he thought they were fortunate in having Dr. Colman. But he was certain the Doctor did not expect to solve this matter entirely by himself; and the question was, were they individually doing what they could to help forward this investigation? Members knew the Naphthalene Committee commenced by sending out a circular, despite the circular-inquiry nuisance. (Laughter.) They were fully justified in sending out the circular, as its object was to discover the works in which it was most desirable to commence this inquiry. Having done this, they did not hear of much appeal to the members of the Association; and he should like some authoritative statement of the fact that the Committee and Dr. Colman were open to receive from anybody any scraps of information which might tend to throw light upon this most complex question. He was one of those who thought that every man in charge of a gas-works should be always making experiments of one kind or another. There was nothing more fascinating or more enjoyable. Here they were committed to this great inquiry; and the more experiments they made the better. Would the Sub-Committee throw out a word of encouragement to individual effort in this way? If the result was of no use to Dr. Colman, he could throw it aside. The man who was making the experiment would benefit by what he discovered, even if the general inquiry did not.

Mr. T. Glover (Norwich), called upon by the President, remarked that they were not to discuss the naphthalene question in its ordinary bearings that day, but to make suggestions to the Naphthalene Committee; and he thought Mr. Browne had done this most admirably. He himself had read the report; and he thought it was a mistake to describe it as the report of the Committee. He took it, it was the report of Dr. Colman.

The President: It is the Committee's report.

Mr. Glover pointed out that it was signed by Dr. Colman—at all events, it represented the work that the Committee had done through Dr. Colman. He had little to say, but he could endorse the suggestion Mr. Browne had made that, if any of the members were experimenting, it was advisable that the Investigation Committee should have the results of such experiments. He need not remind those present that, so far as he was personally concerned, he had been experimenting for some years; and the results of his experiments had been placed freely at the disposal of the members of the Association and others.

Mr. T. May (Richmond) said it occurred to him that, as their chief trouble arose at times when hot days and cold nights were in vogue, inquiry might be made of the works on the Continent where they covered in their gasholders—primarily, of course, with the object of keeping the cold from them in the winter. But as it also kept the sun away from them in the summer, it would be interesting to know what was the effect of such covering-in then. He believed gas-works on the Continent were troubled with naphthalene; and it might be worth while the Committee making an inquiry in this direction. Any way the point was worth discussing. It occurred to him that the time of the year when they got hot days and cold nights was the time when they chiefly suffered; and it might be that, when their holders were exposed to the sun and heat and then to cold nights, this might bring about the deposition that caused them so much trouble.

Mr. T. N. Ritson (Ramsgate) said, as the manager of one of the south-country towns that Mr. Browne had been alluding to, he should like to know whether it would be possible for the Committee to draw up a code of rules or suggestions by which they could individually experiment on the line suggested, which he also thought was quite right. It appeared to him (Mr. Ritson) that, unless they all worked on the same lines, the experiments might be fruitless; but if the Committee could send out a notice explaining exactly how the experiments should be conducted, and what particulars were wanted, then they would all fall into line, and very possibly be able to bring together facts and figures and the results of experiments which would be useful. At any rate, if they were unsuccessful, they would not then be found fault with if they made a mistake, or were not happy in the result. But it was often that a mistake or an accident, or something that was not expected, led to something very definite in the end. He certainly thought Mr. Browne's suggestion was one that was worthy of the attention of the Committee, and that it would be a proper thing to investigate and experiment on systematic lines, which lines, however, should be indicated by the Committee. Then very possibly they would in the result get together something really tangible.

Mr. Norton H. Humphrys (Salisbury) said in the results in the report he saw no reference to the mean temperature at the different works referred to; and this naphthalene question was to a great extent one of temperature. For instance, one of these places might possibly run to a mean temperature even 10° lower than one of the others. Or even in different parts of a district variations in level might bring in a difference to that extent. He had taken a few observations with a thermometer at different works (say) 20 miles apart; and he had noticed there was on the same day a considerable difference in the atmospherical temperature. He thought that, in comparing the results at different works, this point should have some attention; and he would suggest that it should have the consideration of the Committee.

Mr. Ritson said he intended to add that his works were at the disposal of the Committee if they would like to take advantage of them. At Ramsgate they were troubled both at the works and in the district; and he should be thankful for any cure which could be brought to bear on his works.

Mr. J. Meiklejohn (Yorktown) inquired if the Committee had drawn any definite illuminating power line above which they did not find deposits of naphthalene; and if they had so drawn a line as to the quality of the gas, as to whether they had found naphthalene under 16 candles or otherwise. He never knew a manager to complain about naphthalene where 16-candle gas was supplied. At such a place, they might be troubled with it on the works; but he had never known any trouble to arise from naphthalene in the district with gas above 16 candles.

Dr. Colman, replying to the discussion, said he was very much obliged for the kind references that had been made to his work in connection with this inquiry. In reply to Mr. Browne, he was quite prepared to admit the vagueness of the terms summer, autumn, and winter, and that Mr. Browne was quite right in his supposition that what he (Dr. Colman) intended was that the summer should be taken as the period of minimum consumption and the winter as the period of maximum consumption, and the autumn as the period in between, or about the average consumption. Of course, the consumption affected very much, as Mr. Browne had mentioned, the speed at which the condensation of the gas took place, and (he thought he had previously stated) the speed at which condensation took place and the amount of friction to which the gas was subjected, did have an important influence. This was one of the things that had been inquired into; but the results were not sufficiently definite to put anything into the report. They had indeed a large number of other figures which had not been inserted in the report. What they had put in were only figures from which some reasonable conclusions could be drawn; but where the results and figures had not led to any conclusions, nothing had yet been published about them. It was really no use doing so, until they could draw some reasonable conclusion from them. Then Mr. Browne made a remark that he did not know what the various members of the Association were doing. He (Dr. Colman) could only say that, so far as any member of the Association was concerned whom he had had to ask for information or anything affecting the course of the inquiry—and not only members of the Association, but any gas manager whom he had asked for information—it had been most freely placed at his disposal. There had been no attempt on the part of anybody to withhold information, but rather a desire to help forward the inquiry with their whole hearts. And he might say, on behalf of the Naphthalene Sub-Committee and himself, that they were most anxious to get every possible information they could on the subject. The subject was so complex, and the different experiences in the different places varied so much that, as he had mentioned in the report, results were often very contradictory. It was only by getting a large amount of information, and these different experiences, that they would be able to strike a light that might pilot them to the real solution. The same point had been mentioned by subsequent speakers; and he was only too glad to take the opportunity of thanking those—there were too many of them to mention by name—who had given the Committee and himself their help in this inquiry. Then Mr. May also mentioned a matter that had received attention. That was, the question of the variation in the temperature between day and night, and its effect on naphthalene. This variation might act in two ways. It might have an effect on the extent to which the naphthalene was removed in the condensers, or it might be that it had no effect on the condensers, but that, with a greater variation in the day and night temperatures, there would be more tendency to deposit naphthalene out of the gas in the district. The whole object was to keep back the naphthalene in the condenser if possible, so that, in this case, there would be no fear of any variations in temperatures bringing out the naphthalene later on, because there would be none in the gas to come down. As to the temperatures in the district and so forth, there had also been a certain number of observations made in this respect; but as they had not led to any conclusion up to the present, no particular mention had been made of them. Some further information would be required in this regard. Mr. Ritson had mentioned that he would be glad to carry out any experiments at his works at Ramsgate; and when they got farther on, and were able to get more conclusive results from the experiments which they were making at two gas-works, they would be most anxious to get these same experiments repeated at the works of other members, so as to get confirmation of the process tried to bring about a reduction of naphthalene. Otherwise, they would probably find themselves in a very inconvenient position. If they only tried the process at one works, there might be some condition at the works which might be favourable, and which did not exist at another works; so that, when they transferred it to another works, they might find themselves faced by a lot of trouble. However, until they

got a little further—until they had got some definite results from the two works, it was hardly worth while going to other works; but eventually they would do so. As to Mr. Meiklejohn's remarks, he was sorry to have to say that with gas of over 16 or 17 candle power, he had seen naphthalene cases by the thousand; and he thought he could point to many managers in the room who could tell the same story. It might be interesting if he remarked, in connection with the tables that were given at the end of the report, that, at all the works at which the tests were made, the illuminating power was practically the same—that was to say, it varied within the same limits. They were all supplying between 15 and 16 candle power gas; so that they had in these cases the same illuminating power, and yet three works were troubled with naphthalene, and three works were not. He had missed one point, and that was the covering-in of gasholders as practised on the Continent. They had not at present any information as to the influence of this covering-in; and he did not remember having seen anything published on the subject. There had been a lot of work published in Germany on the naphthalene question, but it had been mainly concerned with the removal of naphthalene by washing with oils according to the process of Messrs. Young and Glover, and the one subsequently brought out by Bueb.

Mr. Browne asked to be allowed to put one more question. As to the amount of naphthalene in the gas at the different works, did, in No. 1 table, the "maximum" relate to the summer and the "minimum" to the winter?

Dr. Colman replied that they related to summer and autumn. He believed it was definitely so stated in the report.

The President said he could assure the members that the Naphthalene Sub-Committee would give careful consideration to the several points that had been raised. He thought the suggestion made by Mr. Browne, that experiments should be carried out at some works where the make of gas was larger in the summer than in the winter, was a very useful one. He should like to ask those engineers of companies who had not yet contributed to the funds to again bring the matter before their Directors; and, as the result of this further appeal, he hoped they would receive additional funds. The amount of time taken up in this investigation was very great; and it must not be forgotten that much of Dr. Colman's time was absorbed in travelling from one works to another. This made it all the more difficult to arrive at an early conclusion.

THE AFFILIATION QUESTION.

The President called upon the Hon. Secretary to read the letter dated Nov. 18, 1903, received from the Secretary of the Institution of Gas Engineers (Mr. Walter T. Dunn) with reference to the affiliation of the District Associations with that body.

The Hon. Secretary read the letter as follows:—

Dear Sir,—My Council have given full consideration to the suggestion, made by the Past-President, Mr. Dougall, as to the desirability of the affiliation of the District Associations, and have instructed me to call the attention of your Committee to the Articles of this Institution bearing on the subject.

I am therefore to ask that your Committee will give their best consideration to the suggestion that your Association should become affiliated with the Institution, subject to these Articles.

My Council wish particularly to point out that such affiliation as they contemplate does not involve either change of name, dissolution, or any interference in the existing management of your Association.

It is desired that suitable arrangements should be made for the representation of your Association on the Council of the Institution from year to year, and that those of your members who do not already belong to the Institution should be admitted thereto without payment of the usual entrance fee.

The President said this letter had received the careful consideration of the Committee; and, at their last meeting, they had decided to recommend for adoption the following resolution:—

"That this Association approves the principle of affiliation, and will favourably consider any scheme which may be laid before them."

The Hon. Secretary said it appeared to him that the resolution the President had read to the members provided about the very best means of meeting the situation at the present juncture. He thought this was so, because, as he understood it, what the Institution of Gas Engineers more particularly wanted now was a strong expression of opinion from the various Associations, as to whether they considered affiliation with the Institution was desirable, and, in the event of their doing so, whether they were prepared to affiliate. Now it had been said that the Articles which were alluded to in the letter received from Mr. Dunn were scarcely suitable to the occasion, and hardly consistent with what was intended—that was, affiliation. The Articles, the members who had looked at them would remember, dealt not so much with affiliation as with the formation of Local Sections; and some of the Associations who had already discussed this matter seemed to think that the formation of Local Sections meant dissolution, change of name, and practically a beginning *de novo*. Those of the members who heard the letter from Mr. Dunn would see that the intention of the Council of the Institution was not in this direction at all. They considered the matter at their first meeting when this question was discussed; and it was naurally recognized that an Association holding a strong position in the country was not likely to agree to any scheme of affiliation which meant the giving up of their individuality, and perhaps changing their name and coming under the ægis of the Institution, with a fresh set of regulations drawn up by the Institution itself. If, however the wording of the Articles would form any obstacle in the way of affiliation, he felt perfectly certain there would be no difficulty in getting some revision of the rules to meet the case. Now, as he said before, this matter had received a good deal of consideration by certain District Associations, and some valuable discussion took place at the recent meeting of the Midland Association. On reading the report of the discussion, it struck him that the main difference of opinion was one of principle, and the principle a very vital one. He might put it plainly in the form of a question: Was it advisable for the Institution to promote affiliation with those District Associations the rules of which allowed the admission of members who would be ineligible under the rules of the Institution? He thought that, before anything else could be done, this question would have to be settled. He purposely refrained from offering any personal opinion on the point; but he thought it was the matter that would first of all have to be discussed, because it was the principle on which the amalgamation of the two old Institutions was brought about, and it was, of course, a question whether or not a great many members of the Institution would not think that, in admitting Associations whose members were ineligible under their rules, they were forsaking the principle for which many fought very heartily some short time ago. If the answer to the question were in the negative, then he took it that affiliation on anything like a general scale would be out of the question. However, this led to another point. If such were the case, was affiliation advisable—affiliation which would simply bring in a certain proportion, and not the whole, of the District Associations? If, of course, on the other hand, it was decided that the point might be waived and the Associations themselves should be affiliated, and not necessarily in the affiliation that every member of the Assotions should be affiliated too, then he thought the course was fairly clear. The members might not know, probably they did, that the Council of the Institution, in talking over this matter, had already resolved to ask the assistance of representatives of the various District Associations, and had decided that the President of each District Association should be co-opted to the Council, and that the Council so strengthened should go carefully into this matter. If they were to meet, he had little doubt that they would, in the course of one or two sittings, probably be able to draw up some scheme which would be mutually acceptable both to the Institution and to the District Associations. There were, of course, a number of questions which would require mutual consideration—for instance, the question of uniformity of rules, the question of what share the Institution itself would expect to take in the management of the District Associations, the question of entrance fees, and the question of subscription. But he did not think any of these would form insuperable difficulties. If a scheme could be drawn up, and then laid before the various Associations, he had little doubt that, under those conditions, affiliation would be easy to secure. He thought the main point they had to consider was the question of the vital principle with regard to affiliation—that was to say, whether it would be advisable for the Institution to admit Associations who numbered among their members those who were not eligible for admission to the Institution. He did not think the matter affected the Southern Association very much. They felt that their rules were just as stringent and just as drastic with regard to the admission of certain members as those of the Institution. They all knew what he meant, without mentioning names. Their Association was perfectly free, and the question of affiliation, looked at from their point of view, would be an extremely simple one. Therefore he thought the resolution the President had read was at the present juncture a most suitable one. If they showed they were in accord with the principle of affiliation, and were prepared to favourably consider any scheme which the Institution might bring before them, that was just as far as they were prepared to go at the present moment, and should be prepared to go.

Mr. D. Irving (Bristol): Does the President formally move the resolution?

The President: Yes; I will propose the resolution.

The Hon. Secretary: May my remarks be considered as seconding it.

Mr. H. E. Jones (the President of the Institution) said that in submitting this proposition for discussion, their worthy Secretary had put the matter for decision in the form of a question, and this always made it very intelligible for discussion. He (Mr. Jones) would like to suggest that the best answer was the broadest answer, and the easiest answer, and the one most likely to secure success to the movement, which personally he had very much at heart, because he thought that, while it was a grand step to bring the two Institutions together as they had done, it would be a grander step if they could comprehend all these valuable branches—these extremely valuable branches throughout the Kingdom, and have a kind of common understanding and common footing, so that, when they met a gas engineer who was a member of an Association, they would know exactly whom they had with them. Now he thought the affiliation of the Local Associations did not necessarily involve affiliation of the whole of the members, nor necessarily did it, or ought it, to have as a condition that they must, as it were, dissociate some of the members in order to affiliate. He saw great difficulties in this, because it might be felt that they were going rather farther than, as a comparatively young parent Institution, they ought to go in dictating or formulating rather too severe terms. He saw difficulty in it, because

there might be associations of old friendship, of old mutual support, in many ways, that would be hard to sever; and he did not see that the Central Association (if he might so call it) would necessarily be forfeiting any principle for which they had contended or fought in the past if they affiliated all the branches with the sole condition that those who came to their counsels, those who came to represent those branches at their counsels, must essentially be those who were admitted—true, without an entrance fee, but who were admitted into their ranks through complying with the conditions which they had already laid down, and which they all so completely understood. He did not see why Mr. A. (who was, say, in Manchester or Glasgow) should not be a member of an Association, and that his Association should not be affiliated to the Institution, because there happened to be alongside him in that Association Mr. B., who could not properly qualify himself to become a member of the central organization. He (Mr. Jones) was rather encouraged by their Hon. Secretary as he went along, by him showing that he recognized there would be a middle path (in which there was always safety) by not laying down the hard-and-fast rule that a whole Association must be of a certain quality before they could affiliate. Speaking now as the President of the Institution, he did not think it was for them to lay down too severe lines at all. They had not long been a central, single body. They had yet to make their history; they had yet to make that distinction which would entitle them to the position of father, parent, premier; and it was a little unfortunate that in their rules as they were drawn (which, he was of opinion, was a matter of accident, because he believed they were only transferred from the rules of another scientific society), they appeared to treat these points of variation on a very hard-and-fast line. He echoed Mr. Helps's statement that those rules might be open to revision. He, indeed, would be one of the first to move their revision whenever there was a competent assembly to do it, if the rules placed any barrier—any artificial obstacle—to that coming together which they all desired so much, as giving that mutual strength and mutual importance that he hoped the Institution of Gas Engineers and the local Associations throughout the country would ultimately attain to, and were in a very fair way of attaining. He thought they ought not to let the mere existence of a hard-and-fast, red-tape rule in their scheme as formulated with legal assistance (and no doubt that legal assistance sought for some precedent in the rules of other associations), be any obstacle to a local Association affiliating because in that Association there might be some members who would not be qualified to enter the ranks of the Institution.

The PRESIDENT remarked that, if there was no other member who desired to speak on this question, he would put the resolution. Before doing so, however, he might say that they were fortunate in having both the President and the Hon. Secretary of the Institution present; and after hearing what they had said, there was very little left for him or anyone else to say. Of course, it was open to anyone to join the Institution, if eligible, whether he was a member of a District Association or not.

Mr. W. D. CHILD (Romford) said that before the resolution was put to the meeting, he should like to ask what was the purpose of affiliation of the Association with the principal Institution. In what way would it work to their benefit; in what way would it be done? If the President would give them a little information on these points, it would be acceptable to many members.

The PRESIDENT said it was difficult to give an answer, though he had tried to understand it. (Laughter.) No doubt, if the District Associations were affiliated, their representation on the Council of the Institution would be a strength to each Association, and it would ensure each district being represented. Of course, a District Association, as they all knew, was formed in order that the members might meet together more often than would be the case if only the Institution existed, and a District Association were able to look after local matters; whereas they looked upon the Institution as a parent body, to whom they could turn for advice. If they were affiliated, as Mr. Jones had explained, no doubt it would strengthen each Association. He was afraid he could not give any more detail; and he did not think anyone could. (Laughter.)

Mr. CHILD: Which is to be strengthened—the District Associations or the major Institution?

The PRESIDENT: It will strengthen the whole industry I take it. (Hear, hear.)

The HON. SECRETARY remarked that some figures that were given at the meeting of the Midland Association went at any rate a long way towards answering the question Mr. Child had put. He thought it was Mr. Charles Meiklejohn who stated at that meeting that the total of the member rolls of the various Associations was 957, and out of these members (probably not for the reason that they were ineligible) only some 418 belonged to the parent Institution. Now it seemed to him, from the point of view of the Institution, there was a good deal going to accrue from affiliation, because if the District Associations felt a greater interest in the Institution, as they naturally would do if affiliated, the chances were the Associations would act as good recruiting-grounds for the Institution. Another point was this, that if affiliation was brought about, they would use the various Associations as recruiting-grounds for their papers. Instead of the Hon. Secretary and the Secretary of the Institution spending their time writing to get papers, that labour would be subdivided. Each of the Associations would perhaps then be responsible for a paper. Then there was the question of mutual advantage from the point of view of representation on the Council by one member at least of each of the Associations. Sometimes now the Council of the Institution might not be as representative as it should be of the entire country; and it was impossible for the Council to always know what were the requirements and wishes of all gas engineers spread over the country. A better opportunity would be afforded of bringing the wants and wishes of all parts of the country before the Institution if some such suggestion was given effect to, that representation should be accorded to all the Associations; it would certainly be easier then. But, of course, the main question was one of unity. They all knew the truth of the old adage that "Unity is strength;" and he thought it would spread among the gas industry generally a greater feeling of confidence and strength, if they thought that after all they were branches of the same good, old tree. Then probably the entrance fee to the Institution for qualified members of Associations would be abolished; and any member of an Association, not being a member of the Institution, would be allowed to join the latter without the entrance fee. This probably would be a little inducement. Then, again, the suggestion was made (he believed it was by the Irish Association) that the Institution, after affiliation, might occasionally provide a lecturer, or a paper on some special subject, for, in turn, the District Associations. Altogether he thought that mutual good would accrue in these ways. It was impossible for them at present to speak with anything like definiteness on the subject of what benefits would accrue to either the Institution or the Associations. Naturally, the Council of the Institution were desirous of gauging the feelings of the Associations, in order the better to enable them to formulate some scheme which they could lay before them. Then with a scheme before them, the members of the Associations would be in a far better position to discuss the mutual advantages than they were at the present time.

The resolution was unanimously adopted.

This ended the proceedings; and the evening was occupied by the annual dinner, to which most of the members stayed.

THE TREND OF INVENTION IN RETORTS AND SETTINGS.

Summary of an Address by the late Herr E. Merz, of Cassel.

ON Feb. 3 last, the town of Cassel sustained the loss by death of the energetic and highly capable Manager of its Gas and Water Works, Herr Emil Merz, who had served it in that capacity since October, 1893. Few gas engineers have succeeded by the 48th year of their age in attaining such a world-wide recognition as authorities on all matters of gas-works construction and equipment as had Herr Merz, who thus early in life was called away from the scene of his labours. The "JOURNAL" has from time to time reproduced many of his more valuable contributions to the literature of the gas industry, and the publication now of his presidential address at the last meeting of the Mid-Rhenish Association of Gas and Water Engineers affords a fitting demonstration of the manner in which up to the last his technical knowledge was abreast, if not in advance, of the times. A summary of the address, prepared from the pages of the "Journal für Gasbeleuchtung," is given below.

Retort furnaces for direct firing are no longer constructed; in works of moderate size they have given place to semi-producer furnaces, and in large works to true producers. In many of the more modern works, the latter are associated with inclined retorts, with which system recently simply constructed charging and push-discharging machines for horizontal retorts have entered into brisk competition. Push dischargers, as distinct from drawing machines, is written advisedly, because drawing and charging machinery—especially of the English types—has, with few exceptions, not been introduced into German gas-works. Crefeld is the latest instance of German works adopting English machines.* In Germany, however, there seems to be no predilection for charging and drawing machinery. It is an anomaly to draw the coke from the retorts by machinery, as it is much simpler to push it out; and drawing machines should only be used where the conditions prevent the application of push dischargers.

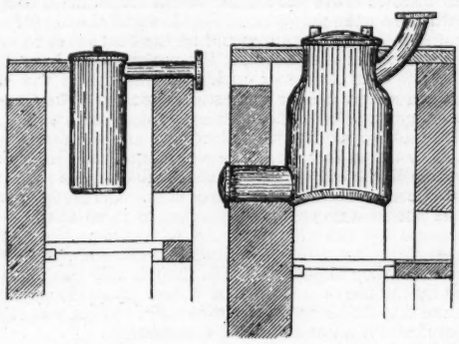
Recently, however, two charging machines have been introduced which promise, in virtue of their simplicity, to rival the inclined retort system. They are the De Brouwer and the Paris machines, which act on the projecting system, and have been described lately on several occasions in the "JOURNAL." Time will show whether in practice they display the same advantages as inclined retorts afford. It may be pointed out, however, that similar apparatus for breaking and conveying coal is required as with inclined retorts; and it is therefore only a question of whether the projecting-charging and push-discharging machines are in themselves superior.

But this is a transition period and age of development in gas manufacture. The ordinary gas-retorts are too small, and much too much ground space is occupied per unit volume of gas produced. The time is coming when either water gas will have to be made in

* See "JOURNAL," Vol. LXXXIII., p. 228.

order to provide a mixed gas as cheaply as possible, or larger retorts or vessels for the distillation of coal will have to be used so as to secure a maximum output of gas on a minimum of ground space. Already there are varieties of apparatus constructed to fulfil these requirements. For instance, there is the chamber oven made by Riepe, of Brunswick, which, on the ground required for two regenerative settings, will carbonize 40 tons of coal (in six chambers) in twenty-four hours—that is to say, the output of gas is increased by 50 per cent. for the same area occupied. The chambers are about 6 ft. 6 in. high, 19 in. wide, and over 19 ft. 6 in. long. It seems to the author, however, that these ovens are unlikely to be extensively adopted, because they closely resemble coke-ovens, in which the heavy hydrocarbons of the gas suffer extensive decomposition, and a loss of both illuminating power and calorific value ensues. Further, at the Munich Gas-Works, a regenerative setting has been converted into a type of chamber oven; and though the results therewith so far do not appear to be very favourable, it is not unlikely that, after remedying the faults of construction, more satisfactory results may be obtainable with it. But the depth of the mass is very great with this oven; and a loss of 10 per cent. in calorific power, and of 6·6 per cent. in illuminating power, has been proved to occur at the present time.

A novelty in retort construction has, however, lately appeared and has been described in the "JOURNAL OF GAS LIGHTING" (Vol. LXXXII., p. 881). It is worth noting that so long ago as 1812 retorts set vertically were employed in gas production, but were given up in favour of horizontal retorts, because it was observed that the gas suffered great loss of illuminating power in its transit through the deep layer of incandescent coal. Now we are returning to the vertical retort; and the inventors of the modern types thereof are overcoming the faults which earlier led to its disuse. One such new type of vertical retort is the invention of Dr. Bueb, of Dessau. It is charged with coal from the top, and has at the side a gas collecting passage, through which the gas escapes to the outlet pipe. The connecting channels between the retort-chamber and the gas collecting passage are constructed of inclined slabs, so that the coal cannot pass into the collecting



GAS-RETORT OF THE YEAR 1812.

passage. The escape of the gas at the side of the retort tends to avoid the decomposition of the heavy hydrocarbons, because the gas is no longer obliged to traverse a deep layer of incandescent coal in order to reach the outlet-pipe.

The English Engineers, Messrs. Settle and Padfield, of Exeter, have endeavoured to avoid the faults of vertical retorts by their method of charging. Instead of introducing, as is the common practice, the whole charge at once, to chill the retort, and prevent the coal being exposed to the proper carbonizing temperature until it is nearly worked off, when the rise of temperature becomes excessive and injures the gas, they charge their pattern of vertical retort piecemeal, so that the heat remains uniform, and the production of gas is in consequence regular. The result is that the retorts last longer, and less tar and scurf are produced, while there is a saving in labour.

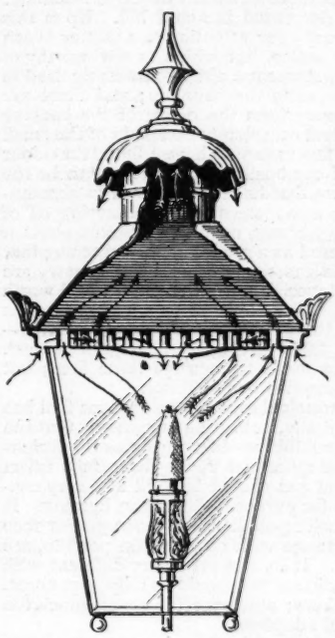
The type of construction adopted by Messrs. Settle and Padfield, with the object of fulfilling these ends, has already been described in the "JOURNAL." The retort is heated externally; and the charge being fed into it from the top in small portions at a time, the gas evolved does not suffer by passing through, over, or in contact with, the red-hot coke, while the quality of the coke is improved. A comparison of transverse sections through an ordinary horizontal retort and this vertical retort, both charged, will make it apparent that the whole of the coal put into the retort meets with more uniform and proper conditions for carbonization in the vertical than in the horizontal retort, in which a core of uncarbonized coal remains after the outer layers have been fully carbonized. When the core is ultimately undergoing carbonization, the gas evolved from it suffers deterioration through contact with the hot outer layers of coke. These unfavourable conditions are avoided in the Settle-Padfield vertical retort, with the result that a greater yield of gas, of higher quality, is obtained with it. The good points of the new system, and the results obtained with it at Exeter, have been enlarged upon in the communications already published with reference to it.

Another method of increasing the productive capacity of retort settings consists in introducing water gas direct into the retorts in which coal is being carbonized. The results obtained by this method at Remscheid have already been published in the "JOURNAL" (Vol. LXXX., p. 1623) and have been deemed so favourable that more extended trials are in progress. If only 20 to 30 per cent. of water gas is added in the retorts to the coal gas, no enrichment with benzol is required; but if the proportion of water gas reaches 40 to 50 per cent., then from 20 to 30 oz. of benzol must be added per 1000 cubic feet of water gas present. This is less than half the quantity of benzol required when the water gas is added in the hydraulic instead of in the retorts.

The foregoing considerations lead to the conclusion that a whole series of valuable improvements is coming into existence in the domain of gas manufacture.

THE "GALEPROOF" STREET GAS-LAMP.

In considering the points of a good street gas-lamp, there are, besides the structural questions of shape, material, and strength, the important ones, in incandescent gas lighting, of having the lantern proof against atmospherical disturbances, and, especially in hot climates, against the ingress to the burner of insects and dust (both of which have a pernicious effect on the mantles), of securing a good reflection of the light, and of, if possible, incorporating in the lantern simple means of assisting in the heightening of efficiency in respect of illuminating power for a given consumption of gas. Various structural changes have been made from time to time in street-lamps with the object of realizing these indisputable advantages, but with more or less success. Messrs. Pond and Co., of Farringdon Street, have introduced into the head of street lanterns of the ordinary pattern—both square and cylindrical—a method of construction, which has been patented, by which they claim to have secured the benefits cited above—that is to say, the flame and mantle are fully protected against draughts (this has been proved to demonstration by severe tests), and it follows, or rather it is asserted, against the inroad of undesirable winged insects and dust. And, moreover, the construction permits only heated air (the bottom of the lantern being completely glazed) to enter the lantern; and the inflow is so caused to impinge on to the top of the flame as to expand it fully on to the sides of the mantle. The illustration and the arrows will explain the course of the incoming and outgoing currents. There is not any direct central outlet for the products of combustion as is usual. The reflector is constructed of two plates—an upper and a lower one, with space between. These two plates are joined together by a number (some 28) of small tubes set in a circle, which have a twofold purpose—first, they serve as outlets for the products of combustion, and, secondly, they act as baffles to the incoming air, which (through the tubes having become heated by the products of combustion) also gets to be highly heated before it passes into the body of the lantern, and to the flame and incandescent mantle. Under and all round the lower projecting rim of the roof are a number of small air-inlets. The air thus obtaining admission passes into the space formed by the two plates, and circulating among the tubes becomes (as already stated) highly heated. It then finds entrance to the lantern through a circular opening in the centre of the reflector and immediately above the mantle; and the downward current has the effect, as previously explained, of spreading the flame on to the sides of the latter, instead of permitting it to retain the usual conical form. The products of combustion are, through this central inflowing of the air, directed to, and drawn up, the numerous before-mentioned tubes, and find an escape at the head of the lantern in the ordinary way. Proof is afforded that the directions of the incoming and outgoing currents are as stated by a simple smoke experiment; under no ordinary circumstances will the smoke obtain an outlet excepting through the small tubes, each one of which, it should be stated, is made and fixed separately, so as to get them quite tight. As to the increase of light obtainable through the supply of the heated air in the special manner described, the patentees assure us that, to put it modestly, the increase may be taken as above 20 per cent.



It is intended to supply the patented arrangement separately, so that it can be adapted to the heads of suitable existing street-lamps, or by other makers to their lamps.

ADVANTAGES OF COOKING AND HEATING BY GAS.

Before the Society of Architects, last Thursday, a paper was read by Mr. T. G. Marsh, of Manchester, on "Domestic Fires and their Relation to the Smoke Nuisance." The chair was occupied by the President, Mr. Walter W. Thomas, of Liverpool.

In the earlier part of his communication, the author pointed out that the domestic coal grate remained the greatest sinner against pure air, and that it was only to municipal authorities, architects, and engineers that it was possible to look for those efforts which would eventually rid our towns and cities of the smoke nuisance. They were, however, on the eve of an inevitable revolution in methods of obtaining power and heat, and the signs had spread further than many people thought. Fuel in the future would be delivered in gaseous form. This was the only solution of a great scientific problem—the conversion of the latent energy stored in coal into an amount of useful work more nearly approaching the mechanical equivalent than was now secured. With a modern steam-engine, they practically obtained only one-tenth of the stored energy contained in the fuel; while with a gas-engine they secured about one-fourth. In 1883, there were only 5000 gas-engines (mostly of small power) being used in Great Britain; whereas to-day there were 90,000 of various sizes. Taking these facts into account, and recognizing moreover that Mond and other power gases were coming largely into use, they might confidently look forward to a time when smoke from engines and furnaces would be a thing of the past.

In the case of gas cookers and fires, Mr. Marsh remarked, the amount of smoke sent out had not decreased to the same extent as with other fuel consumers. He then continued as follows: "We find that there are 1,330,000 gas-cookers in use in the United Kingdom; and these, more especially during the summer months, have considerably decreased the coal bill. Upon this particular subject, I would call your attention to a matter which has probably escaped your notice, but which is well worthy of consideration. Gas cooking-stoves are almost invariably fixed in houses without any connection to the chimney; and there are no means of freeing the house from the odour of the cooking viands. I have frequently had occasion to complain of the smell arising from these. In very few instances have I found the odour to be due to the products of combustion, but generally to be the result of the burning of grease that has been allowed to accumulate on the stove. A simple arrangement for the carrying off of these odours to the chimney-breast or other suitable position would, I am sure, be considered as a great boon; and seeing that one-fifth of the whole of the gas consumers of this country are now users of gas cooking-stoves, I think the matter well worth attention. As regards the heating of our houses, we have in this country almost exclusively the old-fashioned open fire-grates—cheerful in appearance, and wasting a large percentage of the fuel. Various attempts have been made to improve these fires; but they have almost without exception been failures.

I am of opinion that the principal reason why gaseous fuel has not been adopted more generally for heating purposes is that the price has been considered prohibitive—in many cases the various savings attendant upon its adoption not having been fully taken into account. I believe that gas should be sold at a very considerable reduction in price for purposes other than lighting. It may be taken that a gas cooking-stove using gas at 3s. per 1000 cubic feet, and a kitchen range with coal at 16s. per ton, are about on a par as to cost. It is, however, very different with gas-fires. With these, the price of gas should be fully 20 per cent. less than in the case of cookers; otherwise the cost is much too high to allow of their general adoption.

The sale of gas for the purpose of heat and power was never cultivated, but was rather held back, by the majority of our gas authorities until competition began to face them in the shape of the electric light. The wedding together of the two businesses—"lighting" and "heating and power"—was simply a "marriage of convenience;" and though some gas authorities claim that the price of gas should be the same to all consumers, I am not at one with them in this contention, and consider that, like all marriages of convenience, this one (light and fuel) will come to an end unless more favour is shown to the fuel. Though the gas sold in each case is exactly similar, the cost of that which is sold for heat and power is certainly considerably less than that which is used for lighting. The capital expenditure required for supplying lighting gas is about five times that required for the supply of gas for heat and power. In the one case, the greater portion of the annual sale is during four months of the year, and only then during a few hours per day; whereas if the gas is sold for other purposes, it may be said to be equally distributed over the whole year, and is burned on an average nine hours per day (Sundays excepted).

Recently, Alderman Gibson, the Chairman of the Manchester Corporation Gas Committee, said: "We are taking many hundreds a year out of the hands of the poor gas consumers, and putting it into the pockets of large ratepayers who are rich, and do not use gas at all. It is a monstrous robbery; but no one takes up that phase of the question at all. This clap-trap phrase of relieving the ratepayers, is a popular term; but it is utterly at variance with the truth, and utterly fallacious." This is the opinion of a Chairman of a Gas Committee who has had almost a life-time's experience. By municipal authorities the subject should be looked at also from another point of view. The success of a town is largely dependent upon the health of the people, and upon their comfort and happiness. It is therefore the duty of municipalities who are owners of gas-works to so reduce the price of gas for heating and power purposes as to make it within the reach of every household to adopt it.

The allowing of a discount when sold for these purposes appears in the past to have been the great difficulty, inasmuch as it would entail considerable capitalization upon the gas authorities; a duplicate set of pipes and a duplicate meter being necessary for each house. This difficulty, however, I am pleased to say need now no longer be taken into account, as fortunately there are means for registering the quantity of gas used without having recourse to the cumbrous wet and dry gas-meters. The new registering device is not larger than an ordinary breakfast cup, and can be fitted alongside the stove without in any way being obtrusive—in fact, it becomes practically a part of the stove. Where adopted, the whole of the supply for the premises will pass through the ordinary master meter and the usual pipes; and the registration for account purposes will be taken from this meter. For making a rebate on the amount of gas consumed by the stove, the registration of what we may term the discount meter will be taken, and a certain amount will be allowed upon each 1000 cubic feet that has passed through it.

When the public have been fully educated, and are alive to the advantages of gaseous fuel, we may look forward with confidence to the return of our atmosphere to the state of purity existing prior to the days when solid fuel began to be so recklessly burnt; and I have little hesitation in saying that greater profit will accrue from the utilization of the products of combustion than from any policy, fiscal or otherwise, that the country may adopt.

Discussion.

Mr. G. G. Pye, in proposing a vote of thanks to Mr. Marsh for his paper, said he regretted that Sir William Richmond was not present at the meeting. He was rather disappointed at not hearing what class of stove the author would recommend so as to do away with the smoke nuisance in London and the country towns; he expected to be told which would be the best stove to consume its own smoke. He also thought the paper might have touched upon the different classes of coal, and introduced the question of the use of anthracite for domestic purposes. The time would come when gas would be more generally used than was the case now. He had a gas-stove in his kitchen; and the result was that directly they began to cook, there was a smell of gas all over the house, while if the servant was not careful, grease accumulated and soon caused other disagreeable odours. Certainly, gas-stoves should be put in a recess having a flue to it, so that the fumes could escape by the chimney. As to gas-fires, he had found that these threw out a dry heat, and that often if people were in the room long they began to cough, though this was to an extent obviated by the use of a trough of water. Another objection to a gas-stove was that it made the air stuffy. What was the cause of this, and was it an unavoidable drawback?

Mr. E. Marsland seconded the proposed vote of thanks, and remarked that if there was one thing more than another that spoilt the look of their work it was smoke; a glance at St. Paul's Cathedral would convince anyone of the truth of this. He did not, however, think that the substitution of gas for coal was altogether a solution of the problem; but that the remedy was the use of some form of stove whereby the coal was consumed without smoke. In London, they were already considerably annoyed and inconvenienced by the continual pulling up of the roads; and he did not know what would be the state of affairs if a totally new set of pipes had to be laid for the supply of gas for heating and power purposes. The fewer the pipes under the streets, the better they would like it.

Mr. W. Cooper asked whether it was possible to store the natural gas obtained at Heathfield, and subject it to a sufficient pressure to supply a large demand; also whether there were any means by which the destructive effects of gas on pictures, coloured papers, and fabrics could be remedied. This characteristic of gas was one of the great objections many people had to its use for lighting and heating. He knew persons who had tried many kinds of gas-stoves, and had employed a tin of water to create moisture; but notwithstanding this, they said that they suffered from the effects of the gas. If it were possible to have a cheerful looking gas-stove, with some means of preventing the using up of the oxygen of the atmosphere, he thought they would be very near a reformation in the method of heating dwellings. When fixing gas-cookers he always put a hood over them, with a flue into the chimney; and he thought that was a very good way of getting over the unpleasant smell so often experienced. At what price would gas compare favourably with coal for house-fires? In Hastings, they paid 28s. a ton for coals and 3s. per 1000 cubic feet for gas; and he would be glad to know whether, under these circumstances, gas-fires were cheaper than coal.

Mr. B. R. Tucker said he was to a very great extent in agreement with Mr. Marsh. They could not have an illuminating gas of 16-candle power and a gas suited for heating purposes only combined; but he had understood from Sir George Livesey that, if he had only to produce gas for heating, he could do so at 1s. 6d. per 1000 cubic feet, which would, on the author's computation, represent coal at 8s. a ton. This would be a grand thing; and

he thought they could easily get over the difficulty of the injurious compounds resulting from the combustion of gas, if they could obtain it at this rate. The greatest boon of modern times was the incandescent burner; for it enabled them to do away with the need for illuminating power in the gas. If the South Metropolitan Company could supply them with 14-candle power gas at 2s. 1d. per 1000 cubic feet, he quite believed they could manufacture a heating gas at the lower figure named. He thought Mr. Marsh would have given them a good form of slow combustion stove. If they wanted to do away with smoke, they must consume it; and he wondered whether it would be possible to construct a stove that would be quite smokeless. Of course, they could not burn anthracite in an ordinary grate. He would have one gas only—a heating gas; and he thought the time was coming when they would dispense altogether with coal-fires.

Mr. T. W. Richards remarked that to charge two prices for the same thing did not seem a businesslike proceeding.

Dr. Des Vœux said he was a member of the Coal Smoke Abatement Society, which was formed five years ago through the energy of Sir William Richmond. The first object of the Society was to rid London of the smoke of factories; and he thought it would be admitted that on the whole they had been successful. But they also recognized that the smoke of London was due in great part to domestic fires, and so they had turned their attention in this direction. It was, however, a very difficult problem, for it touched the liberty of the subject. So far as he knew, there was only one way of getting rid of smoke from the domestic grate, and that was Mr. Marsh's solution. He had got hold of the right end of the stick, when referring to the smoke from kitchens. If they could persuade people to cook smokelessly, gas-fires would in time extend to all sitting-rooms. It was estimated that there were in London 60,000 chimneys from kitchen fires used daily; and if they could successfully tackle the problem of these fires, the rest would, he believed, follow as a natural course. The advantages of the gas-fire were so great that, in spite of prejudice, it would come to the front on its merits in the future. Seven years ago he determined if possible to cook smokelessly, and installed an ordinary gas-range in his kitchen; and though he left in the coal-range, it had never once been lighted from that day to this. All the servants he had had liked the gas-range, though none had ever used one before. There was, however, one point that had hardly been mentioned, and that was the difficulty of heating water. He had travelled all over London to try and find a solution of this problem. He went to the Gas Companies, who told him to do it by gas; but at that time he discovered that the expense of this would be very great, though it might be less now. Then he fixed up a coke-boiler in the kitchen, and this had been of the greatest service. For an outlay of from 1s. 6d. to 2s. a week, he got throughout his house a good supply of hot water all day and most of the night. In fact, he had so much hot water that he connected three radiators with the boiler, and still had plenty left. If architects could impress upon the public the advantages of smokeless cooking, and that servants did not mind it, and it did not smell, they would have done much. As to the expense of gas cooking as compared with coal, he thought it was practically the same; while, of course, there was in the case of gas an enormous saving of labour and of dirt, which were very important points. With the sitting-room fire, there was a much greater difficulty; but he believed this would settle itself ultimately. Failing anyone else to tackle the subject, he had himself tested a great number of coal-fires; and the results proved conclusively that there was no domestic fire burning ordinary coal that would absolutely get rid of smoke. Every fire must smoke when it was stoked; and he did not think it was possible, with any advance of science, to entirely overcome this. His own experience was that many people objected to gas-fires because they fancied they were unhealthy, and many because they were ugly. He thought, however, they could get over the difficulty of ugliness; while as to the unhealthiness, he must confess he did not believe in it. Many people said gas-stoves were dry; but, on the other hand, it would be found that they were preferred for most, if not all, of the hospitals for consumption. It might be necessary to have a little water going in the room—perhaps it was; but they must remember that when they were burning coal, they were simply burning the gas from it. The difference was that with a coal-fire the gas was unpurified, whereas that which the gas companies sent out was purified. The latter contained a very small amount of sulphur; whereas in the coal used in domestic grates there was a large quantity. This it was that destroyed the buildings, &c. Professor Church had examined the deposit which hid a great part of St. Paul's Cathedral, and found that (he believed) 99 per cent. of it was simply dissolved carbonate of lime and 1 per cent. soot. This carbonate of lime was taken out of the stone by the sulphuric acid in the air. If a gas-stove were stuffy, it must be because it was not supplied with sufficient air. If the ingress of fresh air was prevented, the result would be a stuffy room; but this was not caused by the gas-fire, unless there was an insufficient draught in the chimney. It was exactly the same with a coal-fire; but in that case dirty smoke came into the room, and so the defect was recognized. Therefore, it was a question of ventilation *plus* the gas-fire, and not of the gas-fire itself.

The President, in the course of a few remarks, said the Liverpool Gas Company had for some years past been producing what was commonly known as water gas; and on several occasions when there had been a leakage deaths had occurred. He would like Mr. Marsh to tell them why gas companies adulterated their coal gas with this water gas. He hoped the day was not far distant when the steps which they were taking would stop this practice altogether. As to hot water, he had recently come across a little Fletcher atmospheric stove which had been used for this purpose, and was capable of heating about 75 feet of piping.

Mr. Marsh, in replying to the discussion, said that the President and he had worked together in many matters some 15 or 16 years ago, at which time people in cottage houses were unable to obtain gas. He (the speaker) was the pioneer of the penny-in-the-slot system; and in this the President supported him through thick and thin. Some gas engineers at once thought the matter worthy of consideration; and some told him that their companies would not sell gas in pennyworths. When, however, people could obtain gas in this way, there was a tremendous demand for it. It was then found that gas was used much more in cottages than in larger houses, and gas suppliers saw what an opening there would be if they enabled the poor people to cook by gas. Now thousands of cottagers did the whole of their cooking in this way; and the same thing would take place in the larger houses. People would gradually introduce gas-fires when they got good ones; but he was prepared to admit that he was not satisfied with the present ones. His ideal gas-fire would be one having luminous flames. Some people thought more heat was derived from a bunsen; but if there was perfect combustion, the same heat would be obtained whichever way the gas was burnt. The reason why gas-fires often gave out a bad odour, was because for the first few moments the flame was chilled and combustion interfered with. If there had been in the past an alliance of architects and manufacturers of gas-stoves, he thought a different class of fire would have been on the market. The ideal gas-fire would be one that heated the room by radiation from the flame; and they could draw air from the outside of the room by means of the heat of the gas-fire, and the incoming air could be heated and moistened, if found desirable. The bunsen burner was better for boiling, and for cases in which it was desired to obtain the heat in one particular direction; but if the heat was wanted to radiate all over a room, the proper thing was to have all the radiation from the flame. Then the products of combustion ought to pass away through flues made (say) of iron; and arrangements could be made so that the incoming air came in contact with these flues, and thus had the chilliness taken off it. Tests as to moisture in rooms where coal and gas were used, showed that there was very little difference between the two. With regard to paintings, decorations, &c., what Dr. Des Vœux had told them was perfectly correct. The companies would take very great care that they did not leave any ammonia in their gas, because it was worth £10 a ton when turned into sulphate; while the sulphur, of course, was taken out in purification. He could not say how much natural gas was obtainable in this country; but in America it was carried long distances, and there was no difficulty in storing it. It was sent for miles through mains at pressures of 15, 20, and 30 lbs. per square inch; and he understood that in South Staffordshire Mond gas was to be distributed at something like 10 lbs. pressure. Gas companies had, however, in the past been very conservative in this respect; but if they raised their pressure from perhaps 3 oz. to about 1 lb. per square inch, many advantages would result. For one thing, the system of illumination could be improved by the general adoption of high-pressure lights, and the question of pulling up the streets to lay fresh mains also came in, as with higher pressure a greater volume of gas might be supplied through the existing mains. Mr. G. Helps, the President of the Midland Association of Gas Managers, had stated in his Inaugural Address, read a few weeks since, that he was now supplying a parish some miles away from Nuneaton with gas delivered at a very high pressure, and had found no difficulty whatever. In East Kent the same thing was being done; and he believed also that Sir George Livesey was sending gas into some of his districts at a high pressure. In the past, the value of gas had always been taken at so many candle power; but now there was another value which was of greater importance. In the old days, it was possible to get nearly 3 candles per cubic foot from 15-candle gas, but now four times this amount was obtained; so that, instead of being 15-candle gas, it was practically 60 candles. If the quality was reduced to something like 12 candles, they would still get (say) 50 candles with incandescent burners, it would be as suitable for fires, and it could be supplied at a much lower rate; and to a certain extent the quality of the gas would be standardized. The heating power of the gas should really be the standard, which should therefore be fixed in calories and not candles. As to why the same gas should be supplied at different prices for various purposes, the reason was obvious. To supply the demand for lighting for a few hours daily during three months of the year required four or five times as much plant as was necessary for the same output used regularly in engines or for cooking, &c. Cannel was getting scarce, and if Liverpool insisted upon having gas of about 20-candle power, it must be enriched by means of carburetted water gas. It was, of course, a fallacy to say that carburetted water gas did not smell, for it had a more disagreeable odour than coal gas. He thought that a judicious mixture of the two gases would be decidedly an advantage.

The vote of thanks to Mr. Marsh for his paper was heartily accorded.

MAINTENANCE OF INCANDESCENT GAS-BURNERS.

At the Annual Meeting of the Wisconsin Gas Association last month, a paper on the above subject was read by Mr. E. HAASE, the Secretary of the Milwaukee Gas Company, of which the following is an abstract.

A little more than a year ago, the writer, who then filled the position of Superintendent of the new business department of his Company, urged the necessity of undertaking to maintain illuminating burners, on account of the deplorable conditions then existing, particularly in regard to store-lighting. A canvass was made, intending to show the condition of the lighting, the kind of maintenance service furnished by private parties, and the attitude of the consumer. A great many cases were found where the lighting was so bad that it seemed impossible that a consumer should put up with such a state of things. One clothing store furnished a fair illustration. In it there was an assortment of all the different kinds of incandescent burners that had appeared, with the exception of the latest; cluster lamps were found in which no two burners were of the same type; and numerous burners had parts of different types—some burning in the mixer, some blackened at the top, others with only one-half incandescent, &c. And the proprietors of this store were paying a dealer for a maintenance service! With the consent of the management, two men were set to remedy some of the worst conditions, without, however, having any definite plan to go upon.

A few months later, another phase of the question presented itself. The Company had been instrumental in introducing, through a manufacturer's agent, about 400 or 500 Humphrey "arc" lamps; and the problem of maintaining them and ensuring satisfactory service came up for consideration. The organization of a burner maintenance force was then decided upon; and the service the Company offered to give the consumers was announced in a circular. Two classes of service (business and residential) were arranged for, as follows:—

Business Places.—Regular visits once a week, at which all the burners will be inspected and cleaned, the glassware cleaned, and broken mantles and glassware replaced. The rates for this service will be: 8c. per lamp per month; Humphrey and Welsbach "arc" lamps, 25c. per month (four-light cluster lamps considered as four burners). These charges include all materials furnished, which will be the best of the kind in every case.

Residences.—Upon request by post-card, the Company will send a man promptly to attend to burners, and the consumer will be charged as follows: For each burner cleaned and adjusted, 5c., besides the cost of the material, furnished at the following rates: No. 197 Welsbach mantles, 30c.; "Gas Company" mantles, 30c.; "Capital" mantles, 25c.; "M. G. L." mantles, 20c.; chimneys, 8c.; crimped shades, 8c. For Bray burners (open flame), no charge.

It was believed at the time these rates were put into effect that they would barely cover cost, but that it was necessary to fix them as low as possible in order to make the service effective in bringing about a better condition of things in regard to store lighting. As the maintenance work was begun in midsummer, the Company were able to go into it gradually. Requests for maintenance under the contract system were not numerous until the early autumn months; and for this reason the figures given below cover the records of only the last quarter of 1903:—

Cost of Maintenance under Contract.

Average number of contracts in force	850
Total number of visits made (three months)	9515
Average number of arc lamps under contract	1078
" " single burners "	3555
Number of mantles used	6716
" chimneys "	2748
" shades and sundries used	227
Number of mantles used per burner per quarter (counting "arc" lamps as four burners)	0·85
Number of chimneys used per single burner per quarter	0·77
Cost per burner per quarter—	
Material	11·7c.
Labour	11·5
Supervision and inspection	4 2
Total	27·4c.

Cost of Maintenance upon Request.

Number of orders executed	880
" burners trimmed	1578
" mantles used	1389
" chimneys used	455
" shades and globes used	61
" burner parts used	162

	Total.	Per Burner Trimmed.
Cost of above material	$285·08	0·181
Cost of labour on above	78·28	0·049
Total cost	363·36	0·230
Charged to consumer	492·99	0·310
Profit	$129·63	0·080

From these figures, it appears that the Company's rates for contract maintenance are about 9c. per "arc" lamp and 4c. per single burner below the actual cost of service. For obvious reasons, the service given must be the best; for the consumer will not put up with any other from a gas company. He will exact all he can, because he thinks his bills are high enough to entitle him to it.

The commercial advantages which have accrued to the Company through this maintenance service have been very marked. Just how much it has aided in the introduction of "arc" lamps must, Mr. Haase says, remain a matter for conjecture; but he thinks it is only fair to state that the Superintendent of new business is very positive in his assertion that the maintenance proposition was an important factor. He believes it is not possible to introduce these lamps and keep them in use against the competition of the electric light without a system of maintenance which will ensure lighting that will satisfy the consumer.

The conditions in regard to store-lighting of a year ago have been very materially improved. Inferior gas lighting will not entirely disappear, for there will always be people who will neither pay a reasonable charge for maintenance, nor learn how to take care of burners themselves. The author had the unique experience last winter of having consumers find fault with the amount of their gas bill, and in the same breath acknowledge and emphasize that their light was good. In these cases the maintenance service removed any cause for complaint, and made it easy to satisfy the consumer that he had received actual value for the money he was called upon to pay. Troubles in the way of complaints have been prevented—at least, to a considerable extent—by the introduction of this maintenance service.

ACETYLENE FOR LIGHTHOUSE ILLUMINATION.

From the earliest days of the commercial introduction of acetylene, its value for lighthouse purposes was recognized by experts in this important branch of illumination; and among the most enthusiastic of them were Messrs. D. & C. Stevenson, of Edinburgh. For a number of years these gentlemen experimented with the various methods of generating and burning acetylene then on the market, with the result that they perfected a system which they installed as a permanent station in Grangemouth in 1901. The complete success of this installation enabled them to recommend acetylene for lighthouse purposes; and they have now had erected under their advice four lights in Scotland, one being a first-order light at the Cloch Lighthouse on the Clyde, produced with the same type of carbide and water plant as they use at Grangemouth. This establishment must for many years rank as one of the standard installations of the world. The chief difficulty they had to deal with was the burning of the acetylene, and procuring safe and good generating plant to yield a pure gas; and it was due to these difficulties that the development of the use of acetylene for coast-lighting purposes was retarded for some time. Messrs. Stevenson were the first to recognize the superiority of the Lauder burner compared with others tested by them at Grangemouth, giving, as it does, a light of 50-candle power. We learn that the patentees are at present constructing for the Canadian lighthouse officials a 1000-candle power burner similar in design to that of 250-candle power first made for Messrs. Stevenson for their experiments at the Cloch Lighthouse. These gentlemen may, we think, claim to have made the introduction of acetylene for lighthouse purposes an ascertained success.

DEVELOPMENT OF SANITARY SCIENCE.

At a recent Meeting of the Institute of Sanitary Engineers, the new President—Mr. W. H. MAXWELL, Assoc.M.Inst.C.E., the Borough Engineer and Surveyor of Tunbridge Wells—delivered his Inaugural Address, which was devoted to a review of the progress of sanitary science. Towards the close of it, after having offered a few remarks on the disposal of the domestic and trade refuse of towns, Mr. Maxwell referred to the subject of water supply. He pointed out that the sanitary engineer is often brought into practical contact with this subject, in connection with the distribution of water and laying it on to dwellings and other buildings. He may also be called upon to provide an independent supply to a country mansion or village, and must therefore be conversant with questions relating to the sources of potable water, its storage, purification, and distribution, and the underlying laws of hydraulics and hydrostatics, which apply in the carrying out of such work. He thought it was very deplorable that, notwithstanding the great progress made in this country in the provision of excellent and bountiful supplies of water in practically all our cities and towns, very many villages and hamlets still have to depend on water of a very indifferent character. Within reasonable limits, every household should be encouraged in the liberal use of water, for hygienic reasons; but there is still a very large quantity of rural property scattered throughout the country with no water supply except such as has to be laboriously brought daily or weekly from long distances by the occupants, or such as is derived from shallow wells situated very generally in the small back garden, and in close proximity to the cesspool, the piggery, or the hen-run belonging to the establishment. Here, said Mr. Maxwell, is ample scope for more vigorous activity in the provision of one of the first necessaries of life to a section of the community who are, as a rule, quite unable to help themselves in a matter of this character.

REGISTER OF PATENTS.

Manufacture of Cyanides and Recovery of Bye-Products.—Grossmann's Cyanide Patents Syndicate, Limited, and J. Grossman, of Harpurhey, Manchester. No. 4513; Feb. 26, 1903.

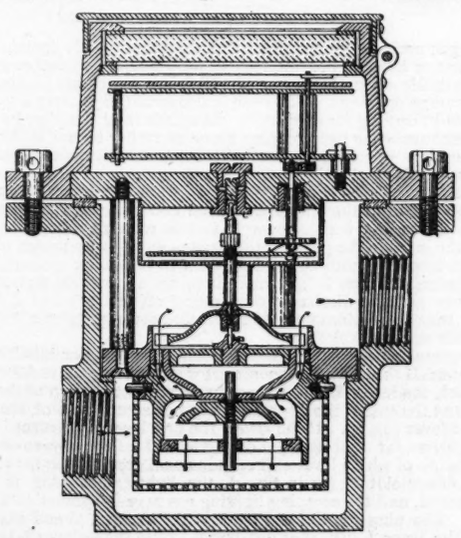
It has been known for many years, the patentees point out, that, on distilling two molecules of ferrocyanide of potash with from three to six molecules of dilute sulphuric acid, hydrocyanic acid is evolved, and an insoluble compound, containing cyanogen, and called Everitt's salt, is formed. It has also been known for many years that the Everitt's salt thus produced may be partly reconverted into ferrocyanide of potash by oxidation to prussian blue and subsequent boiling with caustic alkali. But no method was known whereby these isolated reactions could be combined in such a manner that they would ultimately yield all the cyanogen contained in ferrocyanide of potash as hydrocyanic acid in practically quantitative proportions; nor was it known that other ferrocyanides besides the potassium ferrocyanide follow the same laws. By experimenting on a commercial scale, they claim to have been able to design a method and plant by which they can manufacture cyanides of good commercial quality by distilling ferrocyanides with sulphuric acid, absorbing the prussic acid evolved in alkali, and reconverting the Everitt's salt formed into ferrocyanides in such a manner as to practically obtain all the cyanogen contained in ferrocyanide without loss as cyanide of potassium, sodium, calcium, or similar compounds. They have, moreover, worked out the proportions of the substances employed, and the dilutions of the liquids, in such a manner as are most economical and suitable for the preparation of cyanides from ferrocyanides by distilling with sulphuric acid, and particularly so for the cycle of operations designed.

After a lengthy specification setting forth the cycle of operations necessary to carry out their proposals, the patentees claim as their invention the manufacture of cyanides by the following steps: 1. The decomposition of ferrocyanide with suitable acids or acid sulphates. 2. The distillation of the ferrocyanide and absorption of the hydrocyanic acid in alkali or solution of alkaline earths. 3. The conversion of the insoluble residue of Everitt's salt into a prussian blue by oxidizing substances in the presence of free acid, or by the action of air in conjunction with a lower oxide of such oxidizing substances in the presence of free acid. 4. The conversion of the prussian blue into a soluble ferrocyanide by caustic or carbonate of alkali or alkaline earths. Also the manufacture of prussian blue consisting of the first three steps of the above process; the obtaining of a prussian blue from Everitt's salt by heating it with sulphuric acid and ferrous sulphate or lower oxides of oxidizing substances of similar properties; and the obtaining of cyanides from ferrocyanides as described, absorbing the hydrocyanic acid in milk of lime, in which are, or to which are added subsequently, alkaline sulphates, for the purpose of obtaining a solution of alkali cyanides.

Rotary Water-Meter.—Thorp, T., of Whitefield, Lancs. No. 6017; March 16, 1903.

In this meter (as shown), a turbine wheel is rotated by the water passing through it; the object being to obtain accurate registration of the water and "to render the meter more durable and easily repaired than the meters of this kind hitherto used."

The meter consists of a valve-chamber—which contains (or has fixed to it) all the working and registering parts, and is inserted bodily into an outer casing having an inlet and outlet arranged in such a manner that the water must pass from the one to the other through the chamber. The inlet at the bottom is closed by a weighted valve. Above the valve, the water-way is contracted by an annular projecting baffle plate, which widens out again to the wall of the chamber below



the guide-vanes. The latter, arranged annularly round the inside of the chamber, are narrow in a radial direction, and inclined at an angle, preferably of about 45°. The central part inside of them is filled by a solid disc, to which a cup-shaped bottom is attached, so that between it and the baffle-plate a curved annular channel (gradually narrowing to the width of the guide-vanes) is formed. The load of the valve and the proportions of the valve opening in the baffle-plate and channel have to be varied for meters passing different volumes of water, and to be ascertained by experiment in order to obtain current indications.

Above the guide-vanes, a turbine wheel (of the same width) is placed, having vanes inclined in the opposite direction to the guide-vanes arranged round a central disc, and revolving in a cylindrical shell or extension of the valve-chamber with only a working clearance. This wheel rotates on a dead centre. The wall of the cylindrical shell extends some distance above the top of the wheel. Supported by pillar studs from the valve-chamber is a closed box, having a flange at the top by means of which a joint is made with the casing. The wheel-spindle passes through the bottom of the box with a small clearance only, and carries a pinion driving a train of wheels (say, four), the last of which drives the registering index arranged above the top of the box. All the spindles of these wheels run on dead centres—hard pivots fixed on the bottom of the box entering bores of the wheel-spindles. The upper ends of the wheel-spindles are supported in the same way. The rotation of the turbine wheel is thus transferred at a greatly reduced speed to the last spindle, which passes through the top plate of the box and drives a registering index. This is not reached by the water; the spindle being provided with a stuffing box arranged in the following manner: Into a bore in the top plate a conical leather washer is placed with its apex downwards, and secured by a plug screwed into the bore, coned at the top to fit the washer. The wheel-spindle is reduced in diameter at the point where it enters the conical washer, so as to form a shoulder bearing against the apex of the washer—the plug surrounding the thicker part of the spindle. The water pressure forces the wheel-spindle upwards, pressing its shoulder against the apex of the cone, and thereby pressing the leather against the reduced part of the spindle passing through the washer.

Coal-Stops and Mouthpieces for Inclined Retorts.—Angus, W., and M'Pherson, C., of Nechells, Birmingham. No. 8135; April 8, 1903.

The object of this invention is to provide for the automatic withdrawal and replacement of the coal-stop on the opening and closing of the retort lid, without the use of intermediate joints between the door and the stop; also to ensure the effectual sealing of the mouthpiece of the doors of both inclined and horizontal retorts.

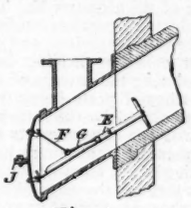


Fig. 1.

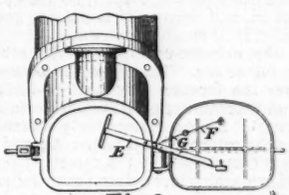


Fig. 3.

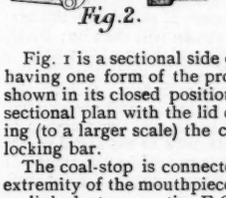


Fig. 2.

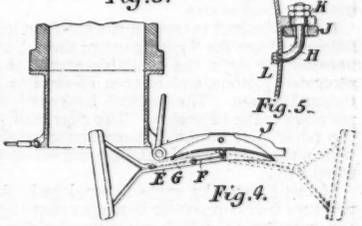


Fig. 4.

Fig. 5.

Fig. 1 is a sectional side elevation, and fig. 2 a plan of a mouthpiece having one form of the proposed arrangement applied—the lid being shown in its closed position. Fig. 3 is a front elevation, and fig. 4 a sectional plan with the lid open. Fig. 5 is a sectional elevation showing (to a larger scale) the connection between the door and the hinged locking bar.

The coal-stop is connected to the inner side of the retort lid at the extremity of the mouthpiece by a rod or bar E, together with the locked or linked stays or ties F G. The end of the bar E has a hook-like connection with the inner side of the door; and thus, as the door is opened and closed, the rod with the coal-stop, to which it is rigidly attached, automatically falls and rises, to permit it to clear the mouthpiece and pass out on the opening of the door, and to return to its service position on the closing of the door. When the door is opened, the stop may be swung clear of the mouthpiece, as shown by dotted lines in fig. 4.

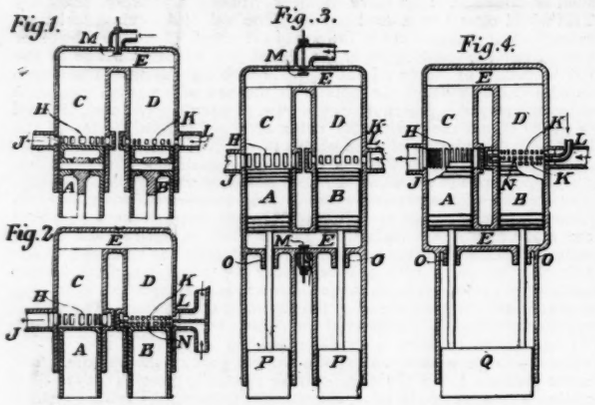
Instead of the usual bolt connection between the outside of the door and the ordinary hinged locking bar J, which permits of a circular movement of the door with respect to the bar in the one plane only, a connection is made between the parts which permits of a double or universal relative movement of the door. In one form, the connection for this purpose consists (as shown by fig. 5) of an angular or curved bolt H passing freely through the bar J, and secured by nuts K L to the body of the door below its centre line, and to the usual rib or projection from the outer face of it. The eccentric neck for adjusting the wear (which is usually provided on the ordinary connecting bolt) is with this arrangement provided upon the nut K.

Gas-Engines.—Robinson, M. H., of Rugby. No. 8495; April 14, 1903.

This invention is applicable both to engines of the four-stroke and two-stroke cycle types.

The engine is constructed with two cylinders C D, with their axes parallel and preferably as close together as possible. The compression spaces of the two cylinders are connected by a passage E and form one joint compression space; the whole arrangement forming a U-shaped combination. The pistons work in these cylinders synchronously—

being connected by piston rods, either to a common crosshead with one connecting rod, or two separate connecting rods working side by side on to one long crank-pin, or on two separate cranks occupying the same angular position on the crank-shaft. Each piston at the end of its forward stroke uncovers a ring of ports in the wall of its cylinder.



The ring of ports H in the cylinder C is connected to the exhaust-pipe J; and K (in the other cylinder) admits, when uncovered, a supply of air under pressure, supplied through the pipe L by a pump attached to the engine or driven by any other source of power. The ports used for exhausting are uncovered by one of the pistons slightly earlier in the stroke than those used to admit air, which are uncovered by the other piston.

In the engine shown in fig. 1—working on the two-stroke cycle—the action is as follows: Towards the end of the explosion or working stroke, the piston A uncovers the ring of exhaust-ports H, allowing the pressure in both cylinders to fall. As the pistons continue their forward course, the other piston B uncovers the ring of the air-ports K. The air rushes in, and drives the remaining products of combustion from the cylinder D, through the passage E between the cylinders, and out through the exhaust-ports H in the other cylinder—leaving both cylinders full of air. This operation occurs during the passage of the crank over the forward dead-centre—both rings of ports being then open; and it continues until the air-ports are closed by the return of the piston B. Almost immediately afterwards the exhaust-ports are closed by the return of the piston A; and thereafter the air in both cylinders is compressed by the return of both pistons, together with a charge of gas, which is sent into the cylinders through the valve M by a pump or from a reservoir. The compressed charge is fired at or about the back dead-centre.

If it is desired to work upon the four-stroke cycle, the action is as follows: After the flushing out of the cylinders as described, following immediately upon the explosion stroke, the air is compressed by the returning pistons, and is then allowed to expand again on the next forward stroke. The second backward stroke compresses it again previous to the explosion. The charge of gas may be injected during the latter part of the idle expansion stroke mentioned, or later, after which the compressed mixture is fired at the back dead-centre in the usual way.

If the two stroke cycle is employed, the gas is introduced under pressure from a reservoir through a ring of ports N (fig. 2) in the wall of the cylinder D, which contains also the ports K supplying the air. The action towards the end of an explosion stroke will then be: First, the piston A will uncover the exhaust-ports H, and the pressure in both cylinders will fall; secondly, the air-ports K will be uncovered by the piston B, and air will rush in to scavenge both cylinders; thirdly, the gas-ports N will also be uncovered by the piston B, and air and gas will come in together. But the area of the ports, and the pressure of the gas and air, are so proportioned with reference to the speed of the engine that the supply of explosive mixture is cut off by the return of the piston B before any of it has time to escape through the exhaust-ports of the cylinder C.

The above-described two-stroke cycle engine may be made double acting; the two cylinders being connected at both ends in the manner explained, and have piston rods passing out through stuffing-boxes O. In this case, the pistons must be of length approximately equal to the strokes (as shown in figs. 3 and 4); and the rings of ports must be in the mid-length of the cylinder, so that the ring of air-ports shall be uncovered by the piston B at the right period before the completion of the stroke in each direction. The ring of exhaust-ports H must be wider in the direction of the length of the cylinders than the ring of air-ports K, so that in its movement in either direction the piston A shall uncover the exhaust-ports earlier than the piston B uncovers the air-ports. Gas must be forced into the cylinders alternately at both ends through the valves M (fig. 3), as required; or, if it is desired to admit gas through ports uncovered by the movement of the piston only without separate valves, there must be two rings K of air-ports in the cylinder D (as shown in fig. 4) one on each side of the mid-length position of the cylinder—the ring of gas-ports N occupying the mid-length position. The length of the exhaust-ports H in the other cylinder must in this case be greater than the combined length over the two rings of air-ports and the ring of gas-ports, so as to preserve the cycle of operations described. If the engine works upon the four-stroke cycle, gas is preferably introduced through a separate valve or valves M actuated in the ordinary way, and not through ports in the cylinder walls.

For the purpose of flushing the cylinders and filling them with air to support combustion on the next explosion stroke, air is supplied under moderate pressure by a separate pump or pumps driven by the engine or otherwise.

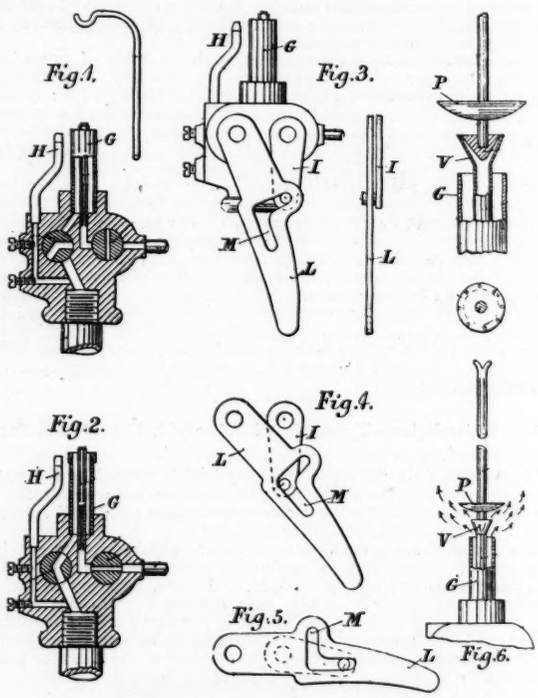
The crossheads may be formed as circular pistons P, working in circular guides closed towards the front end of the working cylinders—thus forming air-pumps (as shown in fig. 3). Or the two pistons may be connected rigidly by rods to one guide piston (Q, as in fig. 4). With a single-acting engine, if two separate circular crosshead guides be used, the combined capacity of the two pumps so formed is adjusted to suit the air supply required.

Burners for Gas and Oxygen Mixtures.—Reiss, H., of Reinickendorf-West, near Berlin. No. 26,095; Nov. 28, 1903.

This specification describes an arrangement of burner from which streams of coal gas and oxygen can be separately introduced under an ordinary incandescent mantle and there ignited "without its being possible for a premature introduction, or too late withdrawal, of the oxygen to take place, and an explosion to be caused."

Figs. 1 and 2 are longitudinal sections of the burner in a closed and opened condition. Fig. 3 is an outside elevation. Figs. 4 and 5 show the positions assumed by the levers of the tap plugs in closing and opening the tap. Fig. 6 is a partial longitudinal section and a plan view of one form of construction of the upper part of the burner.

The burner casing has two tap plugs, placed side by side and separated one from another—one serving to shut off the lighting gas, while the other shuts off the oxygen. The passage operating the discharge of the lighting gas connects with a pipe G fixed in the casing, in which pipe a thinner pipe is fixed with a suitable distance between it and the casing, and through which the oxygen is conveyed into the middle of the main pipe, or rather into the middle of the lighting-gas flame burning out of the pipe A small burner pipe H is placed near the outer pipe, in order to maintain a permanently burning pilot flame. The pipe for



the oxygen may (as shown in fig. 6) have an upwardly increasing enlargement or head V, provided above with a suitable number of holes, and has inside a cone by means of which the oxygen gas is conveyed to the discharge openings. The cone is also arranged to carry a rod above the plate P, serving for supporting the mantle, and the plate having for its object to mix the two escaping gases, or rather to lead in the oxygen gas in such a way that it penetrates into, and mixes itself with, the lighting-gas flame.

The two tap plugs lying in proximity to one another, and operating the shutting off, or the discharge of, the two gases, are each provided outside the casing with a lever L I—one with an elbow slot M, in which the lever of the plug for the oxygen engages by means of a pin. The two levers are thus coupled together in a peculiar manner, and, if, for instance, the lever L be turned, it causes an unequal turning of the two plugs and the discharge or shutting off of the gases at different times; thus again obtaining the result that the apparatus is "rendered quite safe against explosion."

The operation of adjusting the position of the plugs and their action is as follows: If the discharge openings for the lighting gas and the oxygen be closed, the levers L and I are situated so that the pin of the second lever is at the end of the approximately horizontal arm of the slot in the first lever (fig. 3). If, however, the first lever L be turned (say, to the right) so far that the pin of the lever I (of the oxygen-gas plug), the position of which lever still remains unaltered, stands in the middle of the elbow slot M (as in fig. 4), the lighting-gas plug is already half opened, and the escaping lighting gas may be ignited at the pilot flame. The plug for the oxygen is still, however, closed (fig. 1), because the lever I (fig. 4) is unaltered. Now if the lever L be turned further, the pin slips into the second arm of the elbow slot M of the lever L, and, coming in contact with the side of it, is moved with the second lever into the position shown in fig. 5 till in its final position both plugs are fully opened (fig. 2).

In the return movement of the lever L, the operation is performed in the reverse direction; the oxygen-gas plug being first entirely closed (fig. 4), while the lighting-gas plug is still half open and the lighting

gas flame still burning, which only is extinguished when, by the turning of the lever L into the first position (fig. 3), the lighting-gas plug B (fig. 1) is closed.

Pipes or Conduits for use where Subject to Electrical or Corrosive Action.—Johnson, J. Y.; a communication from L. A. Brown and D. Tredway, of St. Louis, U.S.A. No. 1279; Jan. 18, 1904.

This invention relates to the production of, for example, pipes, consisting of a body of metal and an adherent coating of insulating and protective material, composed of sand, sulphur, and cement, preferably in the following proportions: Sand about 55 per cent., sulphur about 35 per cent., and cement about 10 per cent. The composition is said to have the properties of resisting all corrosive influences, and of forming a complete protection against electrolysis and to unite permanently with, or adhere to, the metallic body. It has a "co-efficient of expansion approximating that of iron and steel so closely that no separation ensues between such wide ranges of temperature as from freezing point, or below, up to the point at which the composition softens." The composition also has "great compressive strength," so that it reinforces the pipe to which it is applied, and permits of the use of relatively thin metal, such as sheet iron.

In making the pipe, the metallic body (galvanized on one side if desired) is picked on the exterior; after which the protective coating is applied in the following manner: The sulphur is liquified by heat of (say) about 280° Fahr., and the cement is mixed with it. The sand is then heated to a much higher temperature than the sulphur and cement—say, about 500° Fahr.; and, while in this condition, it is poured into, and thoroughly mixed with, the sulphur and cement. It is said that when the sand is heated to a temperature considerably higher than the sulphur, a minimum of stirring is necessary, and the sand is distributed very readily and uniformly throughout the mass—the grains becoming separated and each encased, as it were, in a film of sulphur. The mixed ingredients assume throughout "a uniform thermic condition," which is finally regulated at about 300° Fahr., whereupon the mass becomes viscid and ready for application.

The composition may be applied to the pipe in any convenient way—for example, by dipping the pipe into the viscid mass and removing it to allow the material which adheres to it to cool. Any required thickness of material may be applied to the pipe by repeated dipping and cooling; or the pipe may be placed in a mould and the composition be poured in until the mould is filled.

APPLICATIONS FOR LETTERS PATENT.

5529.—Grafton, W., "Argand burners." March 7.
5535.—Smith, J. B., and Grant, R., "Gas-producers." March 7.
5570.—Hogan, G. L., "Carburetting and distributing gas." March 7.
5595.—Howorth, F. W., "Gas pressure-regulating apparatus." A communication from the Svenska Carbid- and Acetylen-Aktiebolaget. March 7.
5599.—Francis, A. S., "Incandescent burners." March 7.
5603.—Lennard, F., "Manufacture of carbonate of ammonia." March 7.
5630.—Solari, J., "Gas-fittings." March 8.
5667.—Thomas, D. T., "Triple-piston gas-engine." March 8.
5674.—Lord, W., "Generating gas." March 8.
5715.—Forbes, Sir C. S., "Internal combustion engines." March 8.
5726.—Atkinson, T. N., "Incandescent mantles." March 8.
5733.—Altmann, F., "Gas-burners." March 8.
5752.—Niemeczek, H., "Gas-stoves." March 9.
5825.—Prentice, J. S., "Producing gas for engines." March 9.
5841.—Kay, M., "Atmospheric burners." March 10.
5870.—Frackmann, E., "Burners." March 10.
5871.—Harrison, A., and Crawford, W., "Valves for gas-furnaces." March 10.
5875.—Parish, E. W., "Gas water-heater." March 10.
5899.—Taylor, W. J., "Gas-fittings." March 10.
5911.—Loomis, B., and Pettibone, H., "Manufacturing and mixing gases." March 10.
5912.—Loomis, B., and Pettibone, H., "Manufacturing and delivering gas to engines." March 10.
5918.—Heimann, A., "Incandescent lamps." March 10.
5925.—Skaife, C., "Incandescent lamps." March 10.
5938.—Noad, A. C., "Incandescent lamps." March 10.
5987.—Richards, C. S. & G., "Rotary gas-motors." March 11.
6044.—Eichfelder, F., "Gas-stoves." March 11.
6075.—Fox, T., "Prepayment meters." March 12.
6108.—Alexander, C. J., "Incandescent burners." March 12.
6134.—Lake, H. H., "Bunsen burners." A communication from J. Hardt. March 12.

The Felixstowe Electric Light Undertaking.—It is not usual for the officials of the Local Government Board to display a hesitating attitude in regard to applications made to them for loans. As a rule, they either sanction or refuse. In the case of the loan in respect of the Felixstowe electric light undertaking, however, they appear to find a difficulty in doing either one or the other, though they have had the matter under consideration since last September, when an inquiry was conducted at which a great deal of opposition was brought forward by the ratepayers. In a letter lately received from the Board by the Estates Committee of the District Council, they said they had some doubt as to the proposed arrangement being one which was in all respects favourable to the town. If, however, after consideration of this expression of opinion, the Council desired to press their application, the Board would not refuse to sanction the loan. On receipt of this letter, the Committee again went thoroughly into the terms of the agreement, and decided unanimously to recommend the Council to press the application. This was done at the last meeting of that body, though not without some demonstration on the part of a member.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Sir George Livesey's Evidence on the Tynemouth Gas Bill.

Sir,—On p. 702 of this week's "Journal," in "Gleanings from the Committee Rooms," there is, in the paragraph on the Tynemouth Gas Bill, the following statement relating to my evidence: "The Corporation of Tynemouth were petitioning on all points; and one of their requests was that the Company should be required to supply pure coal gas, and not a mixture of coal and water gas. Sir George thought this was a very proper thing, or rather he saw no objection to it; and the Committee seemed to be rather impressed with his view. With all respect to Sir George, it is not, looked at broadly, at all a thing to be desired that gas suppliers should have their hands tied in this way."

I am so entirely in accord with the "Journal," that I think the best way to put myself right is to ask you to print the following extract from the official shorthand writer's notes; being part of my cross-examination by Mr. Acworth. I claim for the gas industry the utmost possible freedom. No man can be more opposed than I am to the numerous absurd regulations and restrictions imposed on gas companies, which do no good, but much harm to both companies and consumers. The mistake has perhaps arisen from my reply to the Chairman relating to enrichment by spirit, which I regard as quite unnecessary with 14-candle gas.

March 19, 1904. George Livesey.

[Extract from the Official Shorthand Writer's Notes.]

Mr. Acworth: I suppose you would agree then to this: Suppose their Lordships thought proper to reduce to 14-candle power, it would be fair to put this on the Company: "No change shall be made in the composition of the gas, and no enrichment put into it after leaving the gasholder"—in other words, that we should have 14-candle power, all coal?

Witness: Well, if these restrictions are put in these Acts, they would do no good to the public—to the consumers.

Will that do any harm to the Company?—Yes, it might, and to the consumer too. The great difficulty that the gas industry has laboured under has been these endless restrictions. What we now want in this competition is absolute freedom to fight to the best advantage for our existence. It is not fair that we should have one hand tied behind our backs. Electric light is free; there is no restriction about it.

Oh, there are a good many restrictions with regard to electric light?—There is no testing of it, at any rate, for illuminating power.

There are pretty strict regulations about keeping to your exact voltage, are there not?—Are there?

Never mind that. Do you want to supply anything except coal gas if you are allowed 14?—I do not know that we do.

Have you any objection to the Bill saying that you shall not?—I should not like to say that.

[It is true that the remarks in the "Gleanings" last week were the result of the impression made by the reply of Sir George to the Chairman, in which reply "unadulterated coal gas," "unadulterated, unmixed coal gas," and "mixtures" are terms used without, in this particular connection, special reference to spirit. What was in Sir George's mind with reference to enrichment by spirit was not, we are afraid, conveyed by the words of the reply to those present who heard them. Perhaps, however, it will be better for the official shorthand notes of what was said to be reproduced. Following immediately the reply given by Sir George as quoted above, Mr. Acworth said:

That is very reasonable I think?

The Chairman: You are not speaking for the Company; you are giving evidence, Sir George, and perhaps it is hardly a fair question.

Mr. Acworth: I quite agree.

Witness: I only say, my Lord, my own predilection is decidedly for unadulterated coal gas. I do not want to supply the 14 candles. We want now to see what we can get out of the coal. When we had to supply the higher illuminating power, we found we could not get more than 10,000 feet a ton. We now find that with 14 candles, we can get 11,000 cubic feet; and I believe, if we went down to 12 candles we should get, perhaps 13,000 feet per ton. But I believe an unadulterated, unmixed coal gas would be the best; and I should certainly advise this Company here not to think of any enrichment or any mixture of any kind when they have 14-candle gas. If we want to get down to 10 or 8, as we may some day, then I think we shall have to go to mixtures; but when we do go to mixtures, it must be a constant mixture. The objection to the mixed gases is that they vary so much; and the consumer wants gas of uniform quality. That is exactly what we have provided for; no variation after leaving the gasholder.

This is the statement that it was believed impressed the Committee; and it is such Committees as this one who have a large part in the making and the unmaking of laws relating to gas and other matters. It is all very well—and this is said, as the remarks last week were made, with the greatest respect—to tell a Committee that what is wanted "in this competition is absolute freedom to fight to the best of advantage for our existence," but such a statement from Sir George to a Committee as "I believe an unadulterated, unmixed coal gas would be the best," would (even if in this instance the Company had not agreed to accept it) greatly assist the members in deciding to enforce acceptance of the peculiar liberty-restraining clause which now appears in the Tynemouth Gas Bill—viz., "No change shall be made in the composition of the gas, and no enrichment of the gas shall take place after the gas leaves the holder." Of course, everyone who knows Sir George must acknowledge—his actions and work speak loudly of it being so—that he is opposed as strongly as any man can be to the imposition of absurd regulations and restrictions on gas companies; but unfortunately the members of all Parliamentary Committees have not that personal knowledge of his words and actions that the men of the gas industry have.—Ed. J. G. L.]

The Prepayment-Meter Clause.

SIR,—In the interesting communication from Mr. Charles E. Baker in the "JOURNAL" for March 8, on "The Prepayment-Meter Clause," a copy is given of section 32 of the Derby Gas Act, 1903, which section, I may add, was inserted in our Bill at the request of the Chairman of the House of Lords Committee to whom the Bill was referred.

This clause is similar to the Metropolis Gas (Prepayment Meter) Act of 1900, by which the London Gas Companies are prevented from charging more than 10d. per 1000 cubic feet to prepayment consumers above the charge to ordinary consumers, and was passed, I believe, at the instance of the London County Council.

The margin allowed of 10d. per 1000 cubic feet, to cover hire of stove and fittings, meter-rent, and additional expense attendant upon this class of consumer, appears to me sufficient; and it would seem the objections raised by Mr. Baker are perhaps more of a legal nature than arise in actual practice. It is hardly likely any gas company would be deterred from reducing the charge for gas, and so penalize themselves (if under the sliding-scale), on account of the cost incurred in altering the prepayment mechanism, which Mr. Baker thinks would be so costly, but which in the majority of these meters can easily be accomplished at a comparatively small outlay. It appears to me the difficulty may if necessary be overcome by allowing a discount to prepayment meter consumers, calculated upon the quantity of gas used.

I imagine Parliament will insist upon some form of protection being conceded to this numerous and rapidly increasing class of consumers; hence all concerned will be glad of the interest Mr. Baker has shown in the subject, particularly if it results in a model clause being drawn, which, while affording all protection necessary to prepayment consumers, may not in any way hamper or interfere with those who furnish the supply.

The tendency of Parliament is to protect the smaller consumer; and I cannot help thinking this is right, as the larger ones are generally well able to take care of themselves.

Derby, March 15, 1904. J. FERGUSON BELL.

SIR,—I have perused with much interest Mr. Jones's letter, under the above title, in your last issue; and I am quite at one with him that gas undertakings must be on the alert in this matter, or injustice will result. Mr. Jones points out that Parliament has, in several recent cases, fixed upon the figure of 10d. per 1000 cubic feet as the extra sum to be charged, over the ordinary selling price of gas, to cover the cost of the slot meter, boiling stove, and fittings. As Mr. Jones points out, the fairness or otherwise of this extra charge is determined entirely by the amount of gas consumed, and that with a consumption of 12,000 cubic feet per annum 10d. may be a fairly remunerative figure.

In this part of the country, however, our slot consumers are much poorer than those in the London districts; and in Wakefield the consumption varies between 6000 and 7000 cubic feet per annum. Our extra charge is 1s. 1d.; and we find this scarcely remunerative. It would, consequently, be an injustice if Parliament were to saddle us with the figure of 10d., which now forms the only precedent. I therefore hope our experts in parliamentary matters will bear this point in mind, and try to get a more elastic precedent established.

Wakefield, March 18, 1904. H. TOWNSEND.

Reinstatement of Roads with Concrete.

SIR,—In reply to your correspondent "S. X.," the Gas-Works Clauses Act, 1847, section 10, specifies that parties who open roads shall "with all convenient speed . . . fill in the *ground*, and *reinstate* and make good the road." And in the latter part of the section it is enacted that they shall keep the road in good repair for "three months after *replacing* . . . and for such further time . . . as the *soil* so *broken up* shall continue to subside." I cannot understand how anyone can be called upon to do more than *replace* or *reinstate* what has been actually removed; and perhaps "S. X." will say under what Act or authority his Inspector departs from the terms of the section.

Banbury, March 16, 1904. W. R. COOPER.

The Late Mr. Ovington.

SIR,—Mr. Good in his letter to the "JOURNAL" makes a mistake. He had no more to do with the *invention* of tar fuel than my relative. All you stated as to Mr. John O. Ovington was perfectly correct.

Some years ago, tar was a drug on the market. We could get no one to purchase it; and I had to pump it into one of the gasholder tanks to prevent it running down to the Pool river. It occurred to me one day that I might use it for fuel under the retorts. Mr. Good was a retort-setter; and I employed him to alter one or two of the furnaces to try my luck. I was successful, and altered all the furnaces—not only using the whole of the tar made, but also some from stock. Mr. Ovington was my assistant; and he had to see that the work was properly carried out. If, therefore, there was any credit in the affair, I think you will allow that Mr. Ovington had as much to do with it as Mr. Good. But as to Mr. Good giving *me* information with regard to the use of tar for fuel, it is simply ridiculous.

Some time after this, Mr. Ovington was appointed Manager of the Longton Gas-Works. There they were in trouble with their tar. Mr. Ovington had the furnaces altered, and set them free from surplus tar; and he was so successful there, that it gave him the idea of helping others. He therefore wrote an article on "Tar Fuel" for the "JOURNAL." Shortly after this, a gentleman called upon him, and said he had seen his communication to the "JOURNAL," and would like to inspect the furnaces. Mr. Ovington took him over the works, showed him the furnaces, and explained the matter fully to him. The gentleman then said he was the Chairman of Rio Gas Company, and if Mr. Ovington would go out to Rio he might name his own salary. My brother replied that he was very comfortable, and did not want to go; but when he was offered the sum of £1000 per annum, it was too good to be resisted. He therefore went, and did all the Company wanted, and largely increased their dividend.

March 14, 1904. MAGNUS OHREN.

The Proposed Ministry of Health.

SIR,—Your remarks on the above subject in the last number of the "JOURNAL" will, no doubt, arouse considerable interest among those who have been taking up the general question of the control of water supplies throughout the country. I think all will agree that in any new organization or department that may be formed to deal with this matter the medical profession should be represented. The relationship of the Medical Officer to the Water Engineer is at the present time anything but satisfactory, on account of the diversity of opinion which exists among chemists and water analysts as to what constitutes "pure and wholesome water." This state of affairs is, in my opinion, due to the absence of that sympathetic co-operation between the two professions which would, on the one hand, enable the chemist to make due allowance for the physical and financial considerations which are inseparable from questions of water supply; and, on the other, would enable the water engineer to understand clearly the chemical and bacteriological conditions with which he has to comply in order to satisfy the requirements of public health. Any movement having this object in view must secure the cordial support of all who have the interests of both the water undertakings and the consumer at heart.

In this connection, I would draw your attention to the paper presented by Drs. Thresh and Sowden to the Incorporated Society of Medical Officers of Health on the 19th of February. In this paper the authors faced, with exemplary candour and boldness, the fact that no standard has yet been devised by which water supplies may be conclusively demonstrated to be suitable or unsuitable for domestic use; and they proceed to make suggestions with a view to the adoption of such a standard. I am sure all water engineers will wish Drs. Thresh and Sowden success in this most desirable ambition, and will welcome most cordially any decision which may represent the views of the medical profession at large, and therefore be accepted as "final and binding on all parties."

Returning, however, to the proposal to establish a new Department of State and a Minister of Health, I think it should be borne in mind that the President of the Local Government Board has already had the broad question brought before him of establishing a department to deal with the water supply of the country on national lines. The immediate issue was the reference of the proposal to the existing Royal Commission on Sewage Disposal; and this has already borne fruit in the third report of this Commission, dated March, 1903. Herein the Commissioners advocate the formation of District "Rivers Boards" throughout the country, and a central authority attached to the Local Government Board, with powers of supervision and control over all questions of sewage and water supply.

In speculating upon the manner in which the recommendations of this Commission might be carried out, it becomes at once a question whether any such drastic reform of our general public health law could be effected without a careful and thorough revision of the existing Public Health and Water-Works Acts; and the main purpose of this letter is to suggest that this would be a fitting opportunity for all the parties concerned to unite for the purpose, firstly, of determining the lines upon which an amendment of these Acts should proceed, and, secondly, of approaching the Government with a view to securing their support to such an amendment.

At the present moment, the County Councils Association, the Sanitary Institute, the British Association of Water-Works Engineers, and other bodies, have all taken up different branches of the main question; but except for the joint deputation to Mr. Long in October, 1902, no concerted action has yet been taken. Would it not be feasible to form a Joint Committee (such as was recently inaugurated by the Worshipful Company of Plumbers to deal with the question of water regulations), on which all the parties interested—including the water undertakings, engineers, chemists, medical officers, and the various administrative bodies concerned should be properly represented? Union in such matters is strength; and I feel sure that the Government and Members of Parliament generally would cordially welcome the assistance which such a representative organization would be able to afford in framing the basis for legislation. Moreover, it is obvious that the decisions of a Committee formed on these lines would carry enough weight to secure the immediate and active support of the Legislature.

The national importance of the subject must be my excuse for the length of this letter.

54, *Parliament Street, S.W., March* 17, 1904. PERCY GRIFFITH.

Foreign Companies and the Payment of Income-Tax.—With reference to the case bearing upon this subject reported in our "Legal Intelligence" last week, the "Financial News" says: "The income-tax authorities have gone one better than *Goerz v. Bell*. They now claim that where a joint-stock company has more than one office in the same town, income-tax upon the whole of the company's profits is payable *by each office!* If, therefore, a company had 22 offices scattered over London, it would, in compliance with this principle, be liable to pay £1 os. 2d. tax for every £1 of its profits."

Public Lighting of Cheltenham.—In the report of the Elective Auditors of Cheltenham (Major-General Babbage and Mr. J. Gale) on the accounts of the borough for the past financial year, they give the following figures showing the cost of the public lighting in the past four years: Gas, £3861 in 1900, £4109 in 1901, £4158 in 1902, and £3665 in 1903; electricity, £3699 in 1900, £4403 in 1901, £5303 in 1902, and £6625 in 1903—making totals of £7560 in 1900, £8912 in 1901, £9641 in 1902, and £10,290 in 1903. Ten years ago, the public lighting cost the town £4159; but there was no electricity then.

PARLIAMENTARY INTELLIGENCE.

GLEANINGS FROM THE COMMITTEE ROOMS.

THE smart work of the Committees on Monday of last week in connection with the Tynemouth, Sheppey, and other Bills was chronicled in the notes appearing in the following day's issue of the "JOURNAL;" and therefore only four working days of the week remain to be dealt with now. And in those few days gas and water had, after the spurt in the preceding week, quite a small part—in fact, new material is narrowed down to notices of the Matlock and District Gas Company's Bill, the Bexhill Water and Gas Company's Bill, and the Gosport Water Company's Bill, all three of which have come out of the Committee Rooms with flying colours. After Monday, there were no Commons Committees sitting dealing with gas or water. The removal of the Barnet District Gas and Water Bill and the Amersham and Beaconsfield and District Water Bill from Group A, and the settlement with the opposition to the Brixham Gas Bill, cleared completely the list referred to Mr. Tennant's Committee. The disposal, too, of the Sheppey Gas Bill relieved Mr. Cremer's Committee from further service. A commendable feature of the Commons Committees this year is the enlightened grouping by the Committee of Selection. So far, the Committees of the Commons who have sat have had Bills referred to them very similar in kind, instead of the heterogeneous characters on which comment was made in a previous session. The Committees of the Lower House in which the "JOURNAL" has been concerned this session have had to deal almost exclusively with Gas and Water Bills; and the Committees of that House now sitting are almost fully engaged with railway and tramway measures. This is an unwritten rule of procedure that, for obvious reasons, in the interests of promoters and opponents alike, and even in those of the Committees themselves, is very desirable, and should be practised so far as the Bills will allow. There is no doubt about it facilitating work; and it is equally certain that it conduces, through the better understanding of the proposals set before the Committees, to greater justice to all parties. These remarks cannot be applied to the Lords Committees now sitting; the subjects of the Bills with which they have to deal being about as varied as they possibly can be. Regarding the removal of the Barnet District Gas and Water Bill from Group A, its second reading in the House of Commons was postponed from last Wednesday night to to-morrow evening. There is apparently going to be a stiff fight over this Bill on the motion for its second reading. As stated last week, there is a feeling among the suburban local authorities that the water undertakings of the Companies supplying in their district should be brought under the control of the Metropolitan Water Board. The friends of private enterprise in the House of Commons have had their attention called, by circular, to the position taken up by the local authorities in this matter, and to the consequent opposition to the Barnet Bill. The whole idea is unreasonable; and it is atrociously unfair that a Company like the Barnet should be subject to the expense and anxiety over a proposition for which there is not the slightest ground or necessity. Barnet is outside the limits of the Metropolitan Water Board; and the Board have quite sufficient work to do to look after the supply of the dense population within their existing borders. One other general point. In some Gas Bills this session, there has been inserted a power-gas clause. The South Shields Bill contained one; and it was removed in Committee. In the Sheppey Bill there was one; and its excision displaced the only remaining obstacle to the measure proceeding unopposed. The Matlock Bill embraces one; and the Lords Committee who considered the measure last week saw no reason why they should interfere with it.

Matlock District Gas. Had it not been for the ill-considered opposition of the Matlock Bath District Council, the Matlock and District Gas Company's Bill, which contained all the brightest features of modern gas legislation, would have gone through the session, it may be predicted, without impediment. As it was, the District Council appeared in opposition before Lord Barnard's Committee last Wednesday; and, after a very disconcerting time for their witnesses, with Mr. Balfour Browne, K.C., personally conducting the case for the promoters, they were sent away completely discomfited. It will be a strange thing if they come to Westminster again this session on a similar errand. The Company sought incorporation, conversion of old and authorization for additional new capital, a renewal fund, permission to first offer new issues of stock to consumers and employees, further lands, a tramroad from the works to the Midland line, sanction to supply 14-candle gas for lighting and power gas for industrial purposes, with a provision to charge an excess of 10d. for prepayment meters and fittings, power to extend their system to Rowsley and Winster, and other things. The butt of the opposition was to get hold of a small piece of territory which is in the area of the Gas Company, but in the district of the Council for municipal purposes. The object of the Council was a cool one—not only because the Company were in possession, but the people in the district naturally prefer the cheaper gas supply given by the Company. Of course, most of the other provisions in the Bill were opposed, but practically, so far as their discussion went, they were only treated as side-issues. But on the main point as to the coveted piece of area, it should be stated that the Council were prepared to purchase on arbitration terms, if the Committee would give them a purchase clause. There was, however, a strong barrier to the Committee entertaining this, in the fact that in the Council's own Bill of 1896, a clause was inserted to the effect that this portion of the Company's district should not be taken away from them without their consent. The Committee early recognized the position; and intimated to the promoters that they need not labour the point. This rather confounded the opposition. Mr. E. H. Stevenson was retained on behalf of the Bill; and his evidence was (omitting mention of other points) distinctly favourable to the Company being authorized to supply power gas. The case for the Company was considerably curtailed at various stages by the intimations of the Committee as to their satisfaction. The opposition in their case made a very feeble showing; the feature of it being that Mr. Balfour Browne unfolded to the Committee the fact that the Council were not before them with very clean hands in respect of the administration of their own gas undertaking. Their accounts showed a loss on five years' working amounting to £1251; and they had borrowed the money from their bankers, in contravention of the express command of Parliament that any deficiency must be made good out of the district fund, and the next general rate made by the Council increased accordingly. Little time was required by the Committee to decide (as it was clear to everybody in the room they would decide), that the preamble of the Bill was proved.

Compensation for Electrolysis. In order to keep these notes as complete as possible of the doings before the Committees, attention should be directed to the announcement made in a leaderette in last Tuesday's issue of the scoring of a success, the previous day, by the Torquay Gas Company in the matter of a compensation clause for electrolysis in the privately promoted Dolter Electric Tramways Bill, which proposes operations in the town. The circumstances were then succinctly stated; and a longer report of the proceedings will also be found in another column this week. There the same old tale will be read of the promoters' experts not believing in the possibility of electrolysis, and yet resisting tooth and nail the insertion in the Bill of a compensation clause. When the number of municipal authorities who have contended against being saddled with a similar clause, at the instance of companies possessing pipe distribution systems, is remembered, there is something almost humorous in the Torquay Corporation—themselves electricity suppliers—making it a *sine quâ non* to the granting of their consent to this Tramways Bill that a compensation clause should be included in connection with their water-mains and the gas-mains belonging to them in one small district in the borough. This, as stated last week, made the way easy for the Gas Company to secure similar protection for their underground property.

An Uncompromising County Council. The last Bill of their group which Mr. Tennant's Committee were able to consider, owing to the unpreparedness of the remaining ones through obstruction to their progress elsewhere, was that of the Bexhill Water and Gas Company. It was the subject of discussion on Monday; but there was not beneath the surface anything of a serious nature in the opposition. Originally there were several petitions against the measure—one by the Corporation of Bexhill, one by Lord Ashburnham, one by Lord Brassey, one by the Commissioners of Sewers, and another by the East Sussex Town Council. Before the Bill reached the Committee, the first three petitions were withdrawn on terms, the fourth was refused by the Standing Committee on a question of *locus standi*, and the fifth was persevered with, and unfortunately took the whole day to discuss. The Committee from the first suggested that the Bill might pass if the Company and the County Council could adjust their differences; and it was their opinion that there ought to be no difficulty in doing so. It appeared from what Counsel for the Company said, that they had endeavoured to come to an arrangement, but had failed. The Company, however, were still willing to attempt to conciliate matters if they knew exactly what was wanted. On the invitation of the Chairman, Counsel for the County Council explained that their opposition was based on the belief that the Company's pumping operations might cause subsidence of the surface, especially with regard to the Pevensey levels. But it was immediately pointed out, before Counsel proceeded further, that this was the matter referred to in the petition of the Commissioners of Sewers which had been refused a hearing by the Standing Committee as having no *locus*. The Chairman therefore intimated that he could not hear him further on the point. Counsel then took another line, claiming that the County Council were endeavouring to protect the wells in the neighbourhood which might be affected by the pumping operations of the Company; and he, with all the coolness imaginable, submitted the tall order that provision should be made in the Bill for maintaining the level of the water in the wells, and that, if lowered, the Company should be responsible. This claim, Mr. Balfour Browne pointed out, was bad in law; that there was no right in underground waters; and that the Company having settled with the owners of the property, the County Council had no right to try to impose further restrictions.

Further Ingenuity. An Excellent Bill. Fault was next found by Counsel with the extended limits proposed in the Bill, on the ground that some of the parishes could be better supplied on the eastern side by Battle, and on the south-western side by Hailsham. It was true, as was shown by Counsel for the Company, that they had, in the deposited Bill, proposed to take in a part of the district which the Hailsham Company had power to supply; but this having been struck out, had given satisfaction to the Hailsham Company. They were not, therefore, present to oppose the proposed limits. It was further made clear that the Battle reservoir on the east side of the suggested limits was as far from Catsfield as the Bexhill pumping works. Still one more point on the part of the County Council was that the time-limit in the Bill of ten years for carrying out the works, was excessive. This was answered by the Company that they had already offered to reduce the time to five years, and that they were willing to still further reduce it to three years. It was clear that nothing would satisfy the County Council. Sickened of the whole thing, a member of the Committee pointed out that the Company had endeavoured to meet the County Council; and that, if an arrangement was not arrived at which the Committee thought reasonable, the Council would not be able to claim the offers, and the Committee would decide the matter without reference to any negotiations that had taken place. Finally, after evidence had been given for the County Council, the room was cleared; and the decision of the Committee in a few minutes was given passing the preamble of the Bill, and accepting the offer of the Company that the works on the district should be completed in three years. But beyond this, no reference was made to the petition presented by the County Council. If the Bill succeeds in its course, it will form a highly important extension of the Company's powers. As to capital, the

Company ask for authority to raise additional share capital to the amount of £120,000, with £40,000 additional loan capital, and additional loan capital in respect of the old capital amounting to £12,000—equalling in all £172,000. Adding this to the £70,000 of unexpended capital in the hands of the Company gives them unexpended capital powers to the extent of £242,000. This capital is to be expended for a pumping-station, deposit reservoirs, and filter-beds at Boreham Bridge; a pumping-station, deposit reservoirs, and filter-beds at Sweet Willow Wood; a pumping-station at Buckholt, together with a service reservoir to be constructed at Standard Hill (the highest point in the district); and for pumping-mains from the pumping-stations to the service reservoir. These new works will absorb £135,479; while for gas purposes for the next fourteen years, £85,000 is allocated, and for the general extension of the water undertaking, £21,485. The Engineer advising the Company was Mr. Joseph Quick, supported by Mr. W. A. M'Intosh Valon both as regards water and gas; Mr. E. H. Stevenson being also retained on the gas portion.

Gosport Water. After considerable delay caused by the heavy measures which preceded the Gosport Water Company's Bill, the promoters and opponents of the latter obtained their hearing on Tuesday and Wednesday of last week. There was no great weight about the opposition; it being confined to the Droxford Rural District Council, and certain owners, who only, however, represented a part of the original petitioners against the measure. The Company, however, had shown themselves amenable to reasonable terms in respect of compensation for any damage which may be occasioned by their proposed new sources of supply, and so had cleared away much of the hostility that their contemplated objects had provoked at the outset. Some of the proposals of the Bill are absolutely necessary for the good of the community of Gosport; and the Gosport Local Authority recognized this by sending up their Medical Officer to give it support. In view of the opposition, the main question was the scheme for two new pumping-stations; which are to supplant others the supplies from which have become impregnated with chlorine. In addition, the Company asked for further capital, extended limits of supply, authority to purchase the Lee-on-the-Solent water undertaking, and other powers of a minor order. The Droxford Council and the opposing owners thought the new pumping-stations would injuriously affect their springs and other sources of water supply in the district; and they suggested that Gosport should be supplied by the Portsmouth Water Company. That Company were not represented; but their Consulting Engineer (Mr. Joseph Quicke) attended on an order from their Lordships. He made it perfectly clear that, while the Portsmouth Company had surplus water, they had no particular desire to sell it. Evidence was adduced, too, by Admiral Field that, from a naval point of view, it was better that there should be an independence between the water supplies of Portsmouth and Gosport. There is no precedent for Parliament saying that a Company shall not provide themselves with new sources of supply; and that they shall take water from another Company. This was impressed upon the Committee. The promoters showed throughout a willingness to compensate for any damage done; and therefore, with the stipulation that the area within which compensation should be given for damage occasioned by the pumping should be extended to 1½ miles, the Committee passed the preamble of the Bill. The evidence for the Company was supplied by Mr. E. T. Hildred, their Engineer and Manager, Mr. G. R. Strachan, Mr. W. Matthews (Water Engineer of Southampton), Dr. Thresh, and Mr. W. Whittaker.

Barrow Water Clauses. Owing to the great opposition the water clauses in the Barrow Corporation Bill have provoked, the promoters have withdrawn them. Powers to procure water from the River Duddon were conferred on them two years since; but they were restricted from putting them into effect until they had increased their storage capacity at Seathwaite Tarn for compensation purposes. In the present Bill, the Corporation were asking for permission, in the event of serious drought, to take water before the works referred to were finished; but the clauses have been abandoned for the reason stated. The other subjects of the Bill (which was before the Earl of Crewe's Committee on Friday and yesterday) have no direct interest for "JOURNAL" readers.

BILLS AND ORDERS OF THE SESSION.

The Board of Trade report on the applications for Gas, Electric Lighting, &c., and Water Bills and Provisional Orders for the present session has been issued. It shows that the number of Bills relating to the supply of gas is 31 (exclusive of three classed among Electricity Bills, two among Tramway Bills, and five among Water Bills), all of which relate to England and Wales. The capital proposed to be raised is £3,023,514—£2,244,900 by shares and £778,544 by loans. There are 11 Bills relating to the supply of electricity for England and Wales, two for Scotland, and two for Ireland—exclusive of two classed among Tramway and Water Bills. The amount of capital proposed is £12,216,444—£9,880,444 by shares and £2,336,000 by loans; but in seven cases the capital is not stated. There are 28 Bills relating to the supply of water, all (with the exception of one Irish Bill) being for England and Wales. In addition to these, there are four classed among Tramway Bills and one among Railway Bills. The proposed capital is £3,074,832—£910,000 by shares and £2,164,832 by loans; the total including £17,000 proposed to be authorized for water expenditure by Bills classed among Tramway Bills. Provisional Orders to the number of 25 have been applied for in respect of gas and water supply, and 74 in regard to electric lighting schemes. The capital proposed to be raised under these Orders is: Gas, £644,247; water, £189,500; gas and water, £21,332 (making together £855,079); and electric lighting, £1,167,598. Compared with last year, the capital required for gas purposes by Bills is £915,634 less, for water supply £1,218,097 more, and for electric lighting, &c., £5,261,444 more. For Gas and Water Orders, the capital proposed is £186,530 more, and for Electric Lighting Orders £525,372 more.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons and read the first time: Corbridge Gas Bill, Hampton-in-Arden Gas Bill, Whitby Gas Bill.

Bill read a second time and committed: Blyth and Cowpen Gas Bill.

Bills reported: Harlow and Sawbridgeworth Gas Bill, Matlock and District Gas Bill, Tynemouth Gas Bill.

Bill read the third time and passed: Appleby Corporation Gas Bill.

HOUSE OF COMMONS.

Tuesday, March 15.

THE BERMONDSEY CLAUSE AND THE MARYLEBONE ELECTRIC LIGHT UNDERTAKING.

Mr. D. FORD GODDARD moved, with regard to the St. Marylebone Electric Lighting Bill, that it should be an instruction to the Committee to insert provisions in the Bill to the effect that the Council shall, once in every year after the first year's working of the undertaking, cause to be laid before them a statement and balance-sheet of the accounts of the undertaking, drawn up in accordance with the form prescribed by the Board of Trade for a local authority under the Electric Lighting Acts, 1882 and 1888; and that the Council shall thereupon fix annually the charges to be made for the supply of electrical energy in the then ensuing year at such rates (not exceeding the maximum rates specified in the Order of 1901) as that, so far as is reasonably practicable, the revenue for that year shall not be less than the estimated amount of the expenditure and of the charges for interest and sinking fund for that year. Having traced the history of the negotiations between the Electric Lighting Company and the Borough Council, and mentioned the arbitration proceedings, he pointed out that the Bill was not one merely to pay the price agreed upon by arbitration, but went far beyond that. The Bill, in fact, asked for power to raise £1,881,444; whereas under the arbitration the Council were to pay, in round figures, £1,250,000. It was, in short, proposed to take a sum of £500,000 for the purpose of constructing a generating station for themselves. He did not think the instruction was unreasonable; for if the Council supplied electric light at less than cost price, they could make up the loss from the rates—thus inflicting an injustice on poor ratepayers who did not use the light, of whom there were 75 per cent. in the borough. As the Company were willing to continue to sell electricity in bulk, the Corporation ought to be in a position to supply light at present prices without loss. Something might be said for leaving a question of this kind to the judgment of the Select Committee; but the parties who could raise it had no *locus standi*. The honourable member argued that the time had come when such a clause as the one proposed should be inserted in all municipal trading Bills.

Mr. KIMBER, in seconding the motion, said he had given notice of a similar instruction in reference to the Acton Improvement Bill; and, as a general principle, he contended that when municipalities engaged in trading businesses, the accounts should be kept in such a form that the ratepayers could see that a benefit was not conferred upon a few consumers at the expense of the many ratepayers.

Mr. BOULNOIS said he had always been opposed to municipal trading, and had done everything in his power to prevent the Council from entering into such a mad project as the purchase of a huge undertaking under the Lands Clauses Act. He went so far as to refuse to allow his name to be put on the Bill; but the ratepayers of Marylebone having decided by a considerable majority to proceed with the measure to provide the purchase-money, he was anxious to help them to get through a bad bargain in the best way they could. He hoped the House would not make the burden harder to bear, as it would be if the instruction were passed. Of course, the Borough Council were bound to keep regular and accurate accounts. But it was impossible that the undertaking could be made to pay immediately after it was taken over; and the instruction might prevent them from making electric lighting a prosperous concern in years to come.

Mr. MOULTON, supporting the view of the previous speaker, said that in electric lighting the most important thing was that a company or municipal body should have a perfectly free hand in regard to the management of the concern. Of all the large supply businesses he knew, there was not one in which the cost was so enormously diminished by the scale of supply as that of electric lighting; and to give to such a body the power to supply electricity, and then say that if at any moment they found they were not making a profit they must raise their price, was practically to drive them into bankruptcy. An instruction such as the present one could only be proposed in the interests of gas companies. It would be little less than a scandal if, at this stage of the matter, the instruction were sanctioned. Two years ago, the Legislature passed a Bill which not only permitted, but made it the duty of, the Marylebone Corporation to purchase the electric lighting undertaking. The present Bill was simply for the purpose of enabling them to borrow the money necessary to carry out what the Legislature had put upon them. It would not be fair now, when they came to ask for the necessary power to borrow the money, to put these onerous terms upon them.

Mr. BONAR LAW said several requests had been made to the Board of Trade to insert this clause in Electric Light Provisional Orders; but the Board had always refused to do so. As far as he could see, the object of the instruction was, in the first place, to protect private interests—in this case a gas company—against what was said to be unfair competition; and, in the second place, to protect the ratepayers. There could be no doubt whatever that the instruction would fully achieve the first object. It would protect private interests; but at this cost—that it would impose upon the Local Authority, in other words, upon the ratepayers, conditions of competition which were altogether unfair. General considerations of municipal trading had nothing whatever to do with the matter as it now came before the House. Arguments of this kind should be considered when it was to be decided

whether or not certain powers should be given to a local governing body. But when once these powers had been given, as was the case here, it was obviously the duty of the House to see that the Local Authority were put in a position to enable them to trade on as good terms as any private individual. The Board of Trade opposed this instruction on principle. But there were particular reasons why the Marylebone Corporation, of all others, should not have this restriction put upon them; and he thought it was obvious that they should have every possible elasticity in conducting their business, and be put in the position of any private individual, so that a loss might not fall on the ratepayers.

Mr. BURNS also opposed the instruction, believing that, if it were imposed on the Corporation, they would have the greatest possible difficulty in making their undertaking a financial success.

The instruction was negatived without a division.

The following further progress has been made with Bills:—

Bill brought from the Lords and read the first time: Appleby Corporation Gas Bill.

Bills reported: Bexhill Water and Gas Bill, Bishop's Stortford and District Gas Bill, Brixham Gas Bill, Croydon Gas Bill, Ryde Gas Bill, Sheppy Gas Bill, Southend-on-Sea Gas Bill, Sutton Gas Bill.

Bill read the third time and passed: Corbridge Gas Bill.

The second reading of the Barnet District Gas and Water Bill was the first business at the evening sitting on Wednesday. Notices to move the rejection of the Bill had been given by Sir Frederick Dixon-Hartland, Mr. Bigwood, and Mr. Hudson. A further notice, however, stated that the postponement of the Bill until the evening sitting on the 23rd inst. would be proposed; and a motion to this effect being formally made, the measure was, without discussion, postponed accordingly.

HOUSE OF LORDS COMMITTEE.

Monday, March 14.

(*Before the Earl of* CREWE, *Chairman*, *Lord* HYLTON, *Earl* STAMFORD, *Lord* ROMILLY, *and Lord* CAREW.)

TYNEMOUTH GAS BILL.

Further evidence was called this morning in support of the case for the promoters.

Sir *George Livesey*, examined by Lord ROBERT CECIL, gave his view of the relative value of 14-candle power and 16-candle power gas for modern requirements, and added that the South Metropolitan and the Crystal Palace Gas Companies made at least half of their production for purposes other than light, and at least half of the remainder was used with the incandescent burner, which was really a heating burner. As for the comparative calorific power of the two gases, a Board of Trade Committee were now sitting on the subject; and Professor Boys, who had given evidence, had stated the result of his tests of the South Metropolitan Company's 14-candle power gas and the Gaslight and Coke Company's 16-candle power gas for calorific power. The result was that the South Metropolitan gas gave 150 calories and the Gaslight and Coke Company's only 145. This was due to the fact that a very common method of enriching gas was by water gas, which was of a lower calorific power than coal gas. The Gaslight and Coke Company were obliged to enrich with carburetted water gas. So that on every ground the lower-power gas was, in his opinion, the best for gas companies; and now Parliament had very generally, during the last two or three years, adopted these views, and allowed companies to reduce. With regard to the suggested different system of testing, he found fault with the complicated method in use in London, and added that, so far as he knew, it had always been the practice of Parliament not to extend the testing provisions prevailing in London to the provincial companies. Coming to the proposed clause providing that lamps for street lighting should be fixed at a distance of not more than 75 yards apart, he thought it was a perfectly fair one. They had such a limit in London.

Mr. ACWORTH: Has the rate of increase of your Company fallen owing to the introduction of incandescent burners?

Witness: Up to 1900 it was over 6 per cent.; but since then it has fallen to about 3 per cent. We are recovering now, however.

But this Company, supposing they are allowed to reduce their illuminating power, and thereupon are required to put in new flat-flame burners—if we may follow the South Metropolitan analogy—they may be expected to increase at a reduced rate for some years?—It may drop 3 or 4 per cent. for about three years.

And the estimate in the Bill is on an increase of 6·8 per cent. for ten years?—Yes.

Continuing his evidence in cross-examination, witness said £30,000 would suffice to lay 50 miles of streets with new 6-inch mains. It must be remembered, however, that if the district was likely to increase at its present rate, the Company would probably take up existing mains and replace them by larger ones. The South Metropolitan Company, when they abandoned the higher candle power, put in new burners well fitted for 14-candle gas, with the result they gave 13-candle power. There was no obligation on them to continue to renew the burners from time to time as they got bad. The obligation was that, for two years after the reduction of the illuminating power, they should give notice to all consumers that they could have new burners free.

Mr. ACWORTH: I suggest that the moment the 14-candle power burner begins to wear out, it will get worse and worse till it finally will be below the 9 candles given by the 16-candle gas?

Witness: These burners do not wear out. They last for very many years. I have always advocated that gas companies should supply new burners.

Well, do you advocate that it should be put into this Bill?—I do not want to put an obligation upon others.

Supposing their Lordships were to reduce the illuminating power to 14 candles, should we have 14-candle power of coal gas?—If restrictions were put in the Act, it would do no good to the public.

Would it do harm to the Company?—Yes; and to the consumer too. What we want now, with absolute competition, is freedom to fight to the best advantage for our existence.

By the Earl of CREWE: His predilection was decidedly for unadulterated gas; and he did not want to stop at 14 candles. They wanted to see what they could get out of the coal. He believed that unadulterated, unmixed coal gas would be best. He should certainly advise this Company not to have any mixture of any kind, so long as they got 14-candle power.

In re-examination, witness said he thought it would be inadvisable to make any stipulation as to enriched gas, because they did not know the necessities of the future. The gas industry had been hampered by too many restrictions, and they had not been allowed to do the best they could for the consumers.

The Earl of CREWE: On the question of enrichment, supposing the Company's obligation is reduced from 16 to 14 candle power, would it be, under any circumstances, to their interest to enrich gas with spirit instead of making the pure coal gas of 14-candle power.

Witness: I do not think so. What we want is to stop enrichment by spirit altogether.

By Lord HYLTON: The decisions of the Board of Trade in regard to testing would have a wide effect. He could not argue against a clause in this Bill similar to the one inserted in the South Shields Bill.

Mr. *W. Doig Gibb*, the Chief Engineer of the Newcastle Gas Company, stated that the Tynemouth Gas-Works were well-constructed, modern, and calculated to turn out very cheap gas. The Company were held up as a pattern to the small companies. The gas produced in 1903 was 400 million cubic feet; and the works had cost £200,000. This was at the rate of £500 per million. He knew that in any case the gas was about to be reduced by 1d. per 1000 cubic feet, and that if the Bill passed, the price was to be still further lowered—making it 2s. 1d. per 1000 cubic feet. The present price at Tynemouth was 2s. 3d. per 1000 cubic feet. With the discount of 5 per cent. taken off, it was 2s. 1¾d.; with 20 per cent. taken off, 1s. 9½d. net. If the price were reduced to 2s. 1d., less 5 per cent., it would be 1s. 11¾d. net.; less 20 per cent., 1s. 8d. net. This would be the lowest price at which gas had ever been sold in the borough.

To Counsel's query, how these prices compared with those of adjacent companies, witness stated that the present price at Wallsend was 2s. 3d., less the usual discounts; and they had 14-candle power gas. On the other side of the river, the price was very much higher. He had seen the tables bearing on the population of the district concerned. The population increased in ten years by 18½ per cent.; and in the same period the gas consumption increased by 76½ per cent.

By the Earl of CREWE: It was the large consumers who obtained the 20 per cent. discount.

Cross-examined by Mr. FITZGERALD: If the Company had supplied at a price of 1s. 9d. all round, they would probably have been enabled to pay their maximum dividend last year.

In re-examination, witness said the present storage accommodation of the Company was too small.

By Lord ROMILLY: Durham coal was used almost exclusively at gas-works in that part of the country; but it could not produce 14-candle power gas.

Mr. FITZGERALD remarked that Durham coal was used in London, and was made to produce 14-candle power gas. What was done in one place should be done in another.

This closed the case for the promoters.

Mr. FITZGERALD opened the case for the petitioners, the Tynemouth Corporation, by calling

Mr. *E. H. Stevenson*, who said, in his opinion, the promoters, by the proposals in the Bill for increase of capital, were asking too much. He noticed that the accounts showed that the rate of increase in the population had been a decreasing one for the last three years—indicating that the Company had pretty well saturated their district. He considered that a 5 per cent. rate of increase for the future was quite sufficient to estimate for, and this was more than the increase last year. He thought the additional capital which could fairly be asked on this basis for the next ten years was £129,000. If their Lordships were to give the Company £100,000 additional capital with the usual borrowing powers of one-third, they would have £133,000. He was sure this would last the Company for considerably more than ten years.

To Counsel's assertion that it had been usual of late years to apply the auction clauses to share money, witness said he had never known it refused. He did not see any necessity for reducing the illuminating power from 16 to 14 candles in this special case. The Company could get no benefit from it; and the consumer did not wish for it. Therefore, he did not see why the consumer should not pay a little higher for the richer quality of gas. The present maximum price was a great deal too high. He saw no reason to object to the insertion in the Bill of the clause as to testing which was put in the South Shields Bill.

In cross-examination by Lord ROBERT CECIL, witness admitted that enrichment with benzol, which was the method employed by the Company, was undesirable. It would be better to have a pure gas, or a gas enriched before it left the holder. For calorific purposes, enrichment by water gas was also undesirable. He considered that the district was practically full up, and the gas consumption could not increase much. Some of the prices of the estimate were also high. Take the gasholders at £50,000. He was supplying exactly the same thing to-day for £15,000; and the local circumstances were all against him, because he was putting this down at Devonport.

Mr. *J. Smiley*, the Borough Surveyor of Tynemouth, spoke to the population of the neighbourhood, and formed the conclusion that it was possible for there to be an increase of only 3000 during the next ten years.

Cross-examined by Lord ROBERT CECIL: The Company could not help reducing the price of gas, because they had had a handsome balance for some years. They had gone on increasing this balance until they did not know what to do with it. The electric light undertaking was doing pretty well. He was not aware that the electric light was easily beaten by gas.

Mr. *Spencer*, the Mayor of Tynemouth, said, in support of the petition, the Corporation were not opposing the Bill in the capacity of a rival trader, nor were they desirous of keeping the price of gas high. On the contrary, they were doing what they could to keep the price of gas at a reasonable figure for the consumers. Infinitely more people took gas than the electric light, particularly among the less affluent class. He thought it would be inexpedient for the Gas Company to have a large amount of capital at their disposal. The maximum price of gas ought to be very materially reduced. He had considered the question of the reduction of the illuminating power of the gas; and from a common-sense point of view, he felt the consumer was going to lose the benefit of 2-candle power. He had never heard that the gas consumers wished for the change. The complaint had been more the other way; the light was often bad.

This closed the evidence for the petitioners.

Mr. FITZGERALD, addressing their Lordships in support of the petition, stated that the interest of the Tynemouth Corporation was as representing the consumers of gas. The Corporation saw no reason whatever for a reduction of the illuminating power; and the consumers did not desire it. It was felt that a reduction of the illuminating power meant a reduction of calorific power, and, as a consequence, that the consumer would have to use more gas. He maintained that it was the province of the Corporation to see that the streets were properly reinstated and kept in repair. Lord R. Cecil had spoken of the Corporation as rival traders, and suggested that they had come there to hamper the Gas Company and to keep the price of gas high. He (Mr. Fitzgerald) did not think this was a suggestion that could really seriously be made. When people talked about competition between gas and electric light, there might be something in it when they were dealing with high-class residential property and shops; but, in this case, the competition of the electric light was very small.

Lord R. CECIL replied on behalf of the promoters—maintaining that the Company should be unfettered by hostile restrictions.

The CHAIRMAN, in the result, announced that the Committee desired the Bill to proceed. They granted the full amount of capital asked for by the promoters, subject to two conditions—viz., that the debenture stock should be subject to the auction clauses, and that provision should be made for limiting the reserve fund to the amount of capital to be raised after the manner of the sliding-scale clause; the maximum price of gas was to be reduced to 3s.; the South Shields testing-clause was to be put in; and the 75 yards limit for distance between lamps was to be inserted. The Committee made no change with regard to the private streets as provided for in the Bill.

Tuesday, March 15.

The Committee sat to-day for the consideration of clauses. The clause relating to the reserve fund stipulated that the prescribed sum for the purpose of section 31 of the Gas-Works Clauses Act, 1847, should, in respect of the additional capital by the Act authorized to be raised, be one-tenth of the nominal amount of such additional capital from time to time raised by the Company. There were also provisions with regard to the disposal of debenture stock by auction or tender, and for altering the maximum price of gas, making it clear that after Sept. 30, the maximum price to be charged by the Company for gas supplied by them within the borough of Tynemouth and the Urban District of Whitley and Monkseaton is to be 3s. per 1000 cubic feet. In accordance with the Committee's decision, a clause similar to that in the South Shields Bill with regard to testing was inserted, providing that the gas shall be tested with the same apparatus, and by the same method, as may for the time being be prescribed for the testing of the illuminating power of gas in the Metropolis, for which the prescribed number of candles is 14. The rest of the clause reads:

> The gas shall be so far free from sulphuretted hydrogen as not to discolour moistened test-paper imbued with acetate of lead when such test paper is exposed for one minute to a current of gas issuing at the rate of 5 cubic feet per hour. In the event of the Gas Examiner finding any defect of illuminating power or any impurity in the gas, he shall forthwith give notice thereof to the Company at their offices. No change shall be made in the composition of the gas, and no enrichment of the gas shall take place after the gas leaves the gasholder.

The remaining clauses were agreed to; and the Bill was ordered to be reported to the House for third reading.

HOUSE OF COMMONS COMMITTEE.

Friday, March 11.

(*Before Mr.* RUSSELL REA, *Chairman*, *Sir* W. DOXFORD, *Mr.* JOSEPH WALTON, *and Mr.* NICHOLSON.)

ELECTROLYSIS OF GAS-MAINS—TORQUAY TRAMWAYS BILL.

This was a Bill promoted by the Dolter Electric Tramway Company to authorize the construction of a system of tramways in the borough of Torquay. The measure was strongly opposed by the Torquay Gas Company, who wished to obtain protection in connection with electrolytic action on their pipes; the Corporation of Torquay having already obtained the insertion in the Bill of a protective clause for their water-mains before the Bill came before the Committee.

The Hon. J. D. FITZGERALD, K.C., and Mr. VESEY KNOX were Counsel for the promoters; while Mr. CLAUDE BAGGALLAY, K.C., and Mr. TALBOT represented the Torquay Gas Company.

Mr. FITZGERALD, in opening, explained the Dolter system of traction. It was new to this country, but had been tried with great success abroad. The system had worked well in the Bois de Boulogne in Paris, without causing the least inconvenience; and no doubt it would work equally well in Torquay. The Gas Company offered opposition in order to obtain protection from electrolytic affection of their pipes. Counsel then referred at length to the proceedings of Lord Cross's Joint Committee in regard to this matter, and to the regulations drawn up subsequently by the Board of Trade, contending that these regulations provided all the protection that a gas company needed. In this case, the Tramway Company, in order to obtain the consent of the Corporation of Torquay to the promotion of the Bill—this consent being an absolutely essential preliminary—agreed to insert the following clause: "If at any time it be proved that any injury or damage to any mains, pipes, or apparatus of the Corporation shall have resulted from the use of electric current on any of the tramways authorized by this Act, nothing in this Act shall relieve the Company from liability to make compensation for such injury or damage." If the Company could have submitted the clause to the consideration of a Committee, they would have done so; but the Corporation having insisted, as a condition of their assent to the tramways, that the clause should be inserted, the Company had had to insert it. But because the Company assented in that case, it was no reason why the general rule should be departed from. He therefore urged the Committee to refuse the clause.

Mr. *J. E. Waller*, examined by Mr. VESEY KNOX, said it was the invariable custom to give one form of clause whatever the system of electrical traction to be adopted—the form being sufficient to cover all methods of electrical traction. No system could be used except with the consent of the Board of Trade; and therefore it was not necessary that a Committee of Parliament should satisfy themselves as to the merits of any particular system. Another clause regulated the method under which any system approved by the Board of Trade should be applied to tramways. He did not believe there had ever been a single instance in which it was shown that electrolytic action occurred and in which the Board of Trade rules had been acted upon. Should a case occur, he had no doubt the Board of Trade would make their regulations more stringent. He had had experience of 35 cases in which this question of electrolytic affection had been raised; and in only one had a special clause been inserted against the will of the promoters. In the case of light railways, the invariable practice had been to refuse the clause. There was great difficulty in knowing whether corrosion of a pipe had been caused by electrolytic action or otherwise. There were many currents besides those from tramways which might affect pipes; and it was perfectly possible to have corrosion without any current at all—merely by the nature of the soil. If a pipe had a hole in it, there was no means of ascertaining what it was due to.

Mr. VESEY KNOX: If the damage was done to a pipe by any company who broke the regulations of the Board of Trade, the company would have to pay?

Witness: Obviously, it would be negligence; and it is open to any gas or water company, if they have a case of this sort, to go to the Board of Trade, where the records of the company have to be kept. If these records show, as they would show, that the regulations had not been worked to, it would not want any protective clause, in my opinion, to enable the gas or water company to recover from the tramway company.

Cross-examined by Mr. BAGGALLAY: The Corporation supplied gas in a portion of the borough which would be served by the tramways; and they supplied water and electric light in the whole borough.

Mr. BAGGALLAY: Is not the protection that you give to my competitors in lighting a protection that you refuse to me?

Witness: That is so.

Supposing to-morrow the Corporation brought in a Bill to buy my gas undertaking in my half of the borough? Their half of the gas supply would be protected by the clause you have given them; but as regards the mains in my half, they would be subject to the liability to damage?—Clearly. As far as justice goes, neither one nor the other is entitled to protection. But the Corporation have sold us something; and we have paid a price for it. You have not sold us anything.

Monday, March 14.

Mr. *Waller* was re-examined this morning. In reply to Mr. VESEY KNOX, he said that the effect of the improvement provided by the Dolter system was to prevent "arcing," which, at Wolverhampton, with the Lorrain system, was found to have been set up in the contact box—although the contact had been broken; the result being a leakage to earth from the surface. The patent of M. Dolter appeared to be a very reasonable method of preventing this. He had never heard of electrolysis being caused by joint-jumping, which really only occurred in laboratory experiments.

Mr. *W. C. C. Hawtayne* also gave evidence as to the working of the Dolter system in Paris. A report from the inspector who looks after the tramways there stated that, so far as the only matter that would come before him with regard to electrolytic action was concerned (witness supposed the reference was to Suresnes Bridge), ample precautions were taken to protect the bridge, and there had been nothing he could object to. Experiments had been made by witness and his partner; but they had been unable to find there was any leakage between the stud and the rail in ordinary conditions of weather. Even in moderately damp weather, there was no leakage. He did not think there could be any greater danger by this system of electrolysis than by the ordinary overhead trolley system. The leakage, if any, was entirely between the stud and the rail.

Mr. CLAUDE BAGGALLAY having addressed the Committee,

The CHAIRMAN said that the Committee, in the peculiar circumstances of the case, were inclined to grant the protection of the clause; but if Mr. Vesey Knox had anything to say in opposition to this course, they would hear him.

Mr. VESEY KNOX argued that it was not desirable in the general interests of the public that a new experiment should be made more difficult in this country than in any other, and pointed out that if the Committee passed the Bill they would not authorize the experiment contemplated, but would merely authorize the Board of Trade to allow it, if after full inquiry they were satisfied the experiment ought to be made. In no case had the protection sought been granted in opposition to the will of the promoters; and he asked the Committee not to make a precedent in this direction.

The CHAIRMAN: The Committee are not of opinion that this case will furnish a precedent of the kind you suspect in the least, because

we have not the broad principle before us. You have submitted to this already as regards three-quarters of your district; and when we take this fact into consideration, with the additional fact that you have also entered into an agreement that is embodied in schedule 3 (which may enable you to use any system which has not to be considered by any Committee of the House at a future time), and, further, the fact that this is a new thing (which does not make very much difference), we are of opinion that the Gas Company are entitled to the protection of the clause.

The Bill was accordingly amended; and other matters in dispute having been settled, the Bill was ordered to be reported to the House.

HOUSE OF LORDS COMMITTEE.

Wednesday, March 16.

(*Before Lord* BARNARD, *Chairman*, *Viscount* COLVILLE OF CULROSS, *the Earl of* CARNWATH, *the Earl of* LATHOM, *and Lord* NORTHESK.)

MATLOCK AND DISTRICT GAS BILL.

By this Bill, the Matlock and District Gas Company seek to be incorporated as a statutory concern, with increased powers as to capital and supply, and for other purposes.

The Counsel for the promoters were Mr. BALFOUR BROWNE, K.C., and Mr. COURTHOPE MUNROE; Mr. C. C. HUTCHINSON and Mr. A. CLEMENT-EDWARDS appeared for the petitioners, the Matlock Bath and Scarthin Nick Urban District Councils.

Mr. BALFOUR BROWNE, in opening the case for the promoters, said the Company's district had grown and prospered, and the supply of gas had largely increased in the area. Now a further demand had been made upon the Company, because their mains reached up to the boundary of Rowsley. Rowsley asked to be supplied, as also did the district of Winster. There had been no complaint made as to the character of the gas supply; and the Company were here to raise further money to extend their mains to meet the increasing demands on them in their own area. There was only one opponent to the Bill. The Company had managed their affairs well. There was at one time a considerable leakage of gas; and leakage always cost the consumers something. This had been reduced, and was now only 6·5 per cent. The capital proposed in the Bill was £92,000, £46,450 of which was original and £45,550 additional capital. The capital would bear 5 per cent.—the original capital being converted for the purpose. The money asked for would, it was estimated, last twelve years, that being a reasonable time for the Company to keep away from Parliament. The Bill contained provisions for an insurance fund, for the construction of a small tramroad, and for the supply of power gas. An extraordinary feature of the case was that everyone in the district of supply was in favour of the Bill. The Matlock Bath Local Authority opposed in order to get out of the hands of the Company a small tongue of territory which was in their district for municipal purposes, but in the area of the Company for gas-supply purposes. If the Committee assented to the proposal of the Matlock Bath Authority, it would mean the breaking up of the Company's district of supply. Though compulsory powers of purchase were sometimes given, there was no case on record where Parliament had given authority to break up one district in order to give a part of it to another. The position of the tongue of land in the Company's district which belonged to Matlock Bath stood on the basis of an Act of Parliament. The people there did not want to be supplied by the petitioners, but by the Company, and on good grounds, because the Company were able to supply gas much cheaper than the Council. Matlock Bath charged 3s. 7d. per 1000 cubic feet, and the Company 3s. 4d. The petitioners said that the price compared unfavourably with the prices charged in other districts in the county of Derby, the circumstances of which were similar. Did it compare unfavourably with the price in Matlock Bath? They said that the Company were asking for a standard price of 4s. 3d., a renewal fund, an insurance fund, a reserve fund, and a reduction of the illuminating power, without relief to the consumers. But how could this affect the petitioners, who were only connected with a small piece of the district, and all the rest of the district were asking for these provisions? As to illuminating power, the petitioners said if it should be deemed expedient to sanction a lower illuminating power, the promoters should be required to provide, free of charge, suitable burners and mantles. In regard to the capital powers, it was contended that they were greatly in excess of the reasonable requirements, and should be curtailed, and that clauses 29 and 30 of the Bill, as to the sale of shares or stock, were unusual, and open to objection. What did this matter to the petitioners, who were not interested at all, and who had their own undertaking to look after? The petitioners could not invest in the Company's stock; therefore he did not know why notice should be given to them. As to the testing of gas, the Company tested at their works like many other gas-works in the country. There were exceptional provisions in London; but not in the country districts. With regard to discounts, he was sorry to say that large consumers always had the best of it, and small consumers the worst. As to power gas, if the petitioners did not want this, they would not have it. So far as their district was concerned, it could be struck out of the Bill if necessary. Now they came to the real meaning of the petition. The petitioners contended that it was inconvenient and contrary to the interest of consumers of gas, and the inhabitants of their district generally, that an outside Company should supply gas within such district. They desired that provision should be made in the Bill for enabling them to acquire so much of the undertaking of the promoters as was situate within their district upon arbitration terms, and a further provision that, in the event of such a purchase, the undertaking should not be held to have been enhanced by the passing of the Bill. This was the whole object of the Bill—that the disputed area should be taken over on arbitration terms. To do that would be a breach of faith; for in 1896, when the Matlock Bath Council obtained power to purchase their present undertaking, a clause was inserted in the Bill to the effect that the disputed area should be supplied by the Company, and should not be taken away from them without their consent in writing.

Dr. *Wm. Moxon*, the Chairman of the Company, gave evidence in support of the opening statement of Counsel. He said that the petitioners were precluded by statute from supplying gas in the small part of their district within the limits of supply of the Company without the consent of the latter. The price of the Company's gas was 3s. 4d. per 1000 cubic feet, with certain discounts; the charge by the petitioners was 3s. 7d. All the neighbouring authorities were in favour of the Bill, as were also the Midland Railway Company and the Derbyshire County Council. The Company's standard price was 4s. 3d.; but they had never taken advantage of that.

Witness was cross-examined by Mr. HUTCHINSON with the object of showing that one of the objects of the Bill was to supply Rowsley, where the undertaking was unremunerative, and that, therefore, the Matlock Bath consumers would be prejudiced. He denied that the population of Rowsley was on the decline, and pointed out that the Company's pipes were already carried to the Rowsley boundary. He had not considered the question of supplying power gas to the extent of allocating capital for it.

Mr. HUTCHINSON: Do you know of a case in which a small company supplying illuminating gas has ever had conferred upon it the privilege of supplying power gas?

Witness: I do not.

Witness further stated that the Company had charged 3s. 8d. per 1000 cubic feet for their gas during the coal famine period.

Mr. *E. Herbert Stevenson* said he was familiar with the Company's undertaking. He was sure that the proposed extension would be a good thing.

The CHAIRMAN said the Committee did not think it necessary to go into the question of the desirability of extending the supply to Rowsley and Winster.

Witness (continuing) said he thought the capital of the Company was a very reasonable one indeed. The rate of increase had been most rapid. During the past five years, it had been 9¼ per cent.; and in the five years before, it had been 6·35 per cent. The works were good and well managed; but capital would be required for an extension of mains. The leakage of gas had been reduced from 18 to 4 per cent. The capital asked for would last for twelve years. The Company already had power to establish an insurance fund. Witness then gave evidence to justify the construction of the proposed tramway. With regard to power gas, he thought it would be desirable that the Company should be able to supply it. He did not know what kind of power gas would be made under the Bill. He saw nothing against this supply, thinking it better that there should be only one authority to break up the roads and streets. The gist of the petition was that the petitioners wished to break up the Company's district; but Parliament always refused to assent to such a proposal, on the ground that it was difficult to say what should be done with the money, and that it was difficult to subtract a portion of a district without prejudicially affecting the remainder. The Company, though they had supplied gas below the standard price, had never increased the standard rate of dividend. They had given the consumers the whole of whatever benefit had arisen. There was no complaint of the supply; and the quality of the gas was good.

Witness then gave evidence to show that Matlock Bath had not fulfilled the conditions of their own Act. It would be a bad thing for the Matlock Bath consumers to be compelled to take the gas of the Urban District Council.

In cross-examination by Mr. HUTCHINSON, witness said that formerly he had advised the Matlock Bath Council to get the gas supply of the whole of their district. The proviso giving the present promoters power to supply part of the district was inserted in the Matlock Bath Bill before it came on; but he did not know it was because there were concurrent powers of supply and no provision for compensation. The price of the power gas it was proposed to supply had not been put in the Bill, because the promoters had not yet decided what kind of gas they would manufacture.

The CHAIRMAN said the Committee were not much impressed with the opposition to the proposal to supply power gas.

Mr. *H. Calland* gave evidence in favour of a supply of power gas. He objected to the division of the Company's district.

This concluded the case for the promoters; the Chairman, in reply to Mr. Balfour Browne, declaring that the Committee did not wish to have further evidence for the Bill.

Mr. HUTCHINSON then called evidence for the petitioners.

Mr. *Lawton*, the Chairman of the Matlock Bath Urban District Council, spoke in support of the petition, declaring that the Council desired to purchase the part of the Company's district of supply which was within the Matlock Bath area. They would pay the value of it, with an additional 10 per cent. The acquisition of this area would put the whole of the Matlock Bath undertaking on the same platform, which, he thought, would be a desirable thing.

In cross-examination by Mr. BALFOUR BROWNE, witness said the works of the petitioners were to be removed. In 1899 and 1900, they had made a slight loss. There was a loss of £210 in 1901, of £465 in 1902, and £225 in 1903. Still, they were doing well. They had deferred using their parliamentary powers, and had got the money from their bankers. They had acted in this matter with the sanction of the Goverment Auditor. The clause under which the tongue of the Matlock Bath area was included in the Company's district meant that the area should be a part of his Council's district if a proper arrangement could be made.

Mr. *W. Jaffrey*, the Surveyor to the petitioners and Manager of their gas-works, said that the make of gas in their district last year was 18,490,000 cubic feet, or a decrease in the make of 1·2 per cent.; but through the saving in leakage, the consumption had increased 10·3 per cent. The profit on the gas in 1876 was £768, and last year it was £1063, or an increase of 38·4 per cent. The strongest reason why the district in dispute should be transferred was because there should not be too many authorities empowered to pull up the roads. Other reasons were that the supply and illuminating power of the gas should

be uniform, and that the prices should be equalized throughout the Matlock Bath district.

In cross-examination by Mr. BALFOUR BROWNE, witness said that they had power to supply Bursall with gas, but up to the present had not done so. It was not correct that the Council had borrowed from their bankers to pay the deficit. They had drawn upon net revenue account for capital expenditure, but as a matter of fact had not charged the ratepayers a penny in respect of the undertaking.

Mr. *Carlin*, a member of the District Council, also gave evidence in support of the petition.

Mr. HUTCHINSON then addressed the Committee for the petitioners; declaring that if his case were allowed, good would be done to his clients, while no harm could possibly accrue to the promoters. It was solely a matter of pounds, shillings, and pence with the latter; and they surely could be satisfied in this respect by appeal to an arbitrator. They would receive 10 per cent. bevond what they could assume that they should receive. Even if the disputed area were left with the Gas Company, he appealed to the Committee not to allow the promoters the inflated amount of capital for which they asked. He maintained that in these matters Parliament was not to be bound by lack of precedents. The circumstances justified the appeal that was now made by the petitioners.

The Committee announced that they did not desire to hear Mr. Balfour Browne in reply; having come to the conclusion that the preamble of the Bill was proved.

Clauses were then adjusted; and the Bill was ordered to be reported for third reading.

HOUSE OF COMMONS COMMITTEE.

Monday, March 14.

(*Before* Mr. TENNANT, *Chairman;* Mr. PLUMMER, Mr. DUNCAN, *and* Mr. W. RUTHERFORD.)

BEXHILL WATER AND GAS BILL.

The objects of this measure are to extend the limits of supply of the Bexhill Water and Gas Company, so as to include the parishes of Catsfield, Ashburnham, Wartling, Hurstmonceux, Hooe, and Ninfield, to raise additional capital, to construct water-works, &c.

Mr. BALFOUR BROWNE, K.C., Mr. MOON, K.C., and Mr. C. C. HUTCHINSON appeared for the promoters. The only petitioner against the Bill—the East Sussex County Council—was represented by Mr. W. L. WILLIAMS.

Mr. BALFOUR BROWNE, in opening, said the total share and loan capital of the Company amounted to £180,000, of which £110,191 had been raised. The Company were now asking for additional capital to the extent of £120,000, inclusive of premiums upon the issue of stock. The population of Bexhill, which in 1891 amounted to 5208, had now risen to 12,213, in addition to which in the summer time the visitors were estimated to number some 30,000. The Company were, of course, obliged to supply water for the use of the visitors as well as of the resident population; and it was reckoned, therefore, that the new capital now asked for would not last them for more than twelve or fourteen years. In 1891, the quantity of water pumped amounted to only 15 or 16 million gallons per annum; but it had now risen to 154 millions per annum. The number of water consumers had also increased from 418 to 2081. The Company's output of gas had more than doubled in the course of the last six-and-a-half years; and it was necessary to make provision for providing a much greater supply of gas in the future. The Company had already purchased from Lord Brassey land at Buckholt, from a spring in which something like 200,000 gallons a day was being pumped into the Westwood Reservoir, which quantity could not be increased. The Company had also acquired of Lord Ashburnham 3 acres at Sweet Willow Wood, and had sunk a borehole there 250 feet deep into the Ashdown beds, from which 400,000 gallons a day could be obtained. The Committee were now asked to legalize by the Bill the sinking of wells on property already belonging to the Company. So much had the demand for water increased more than the available supply, that it was only possible at present to give a supply of 20 gallons per head per day to the summer population. The Company, therefore, proposed to construct additional water-works at Sweet Willow Wood and at Boreham Bridge, which, it was calculated, would afford an additional supply of 800,000 gallons. This water would be conveyed to a reservoir on Standard Hill, between Boreham and Bexhill, capable of holding 28 hours' supply. As the Duke of Richmond's Commission had put on water companies the liability to supply intervening places, the Company asked for powers in the Bill to supply the district between Boreham and Bexhill, which was certain to be developed for building before long, and also to extend their limit to include Ninfield, Hooe, Catsfield, Wartling, Ashburnham, and Hurstmonceux, comprising an area of 22,000 acres, and a population of just under 400. The districts were agricultural, and were already adequately supplied with water from wells, and could not be supplied at a profit by the Company. This was, however, a matter for the Company. Provided they were guaranteed 5 per cent. on their capital expenditure for a period of five years, they were willing that their powers under the Bill should cease if they were not exercised within three years.

Mr. *John Plummer*, a Director of the Company, giving evidence in support of Counsel's statement, said his Company was incorporated in 1885, when Bexhill was a small place. Their original source of supply was at Westwood, where they had a pumping station, a reservoir, and a high-service tower. To get an additional supply they had gone to Buckholt, where they took water from a surface spring to the amount of 200,000 gallons a day. They next had to go to Sweet Willow Wood, just outside their boundaries, and there sink two boreholes; and they were now proposing to buy additional land there for boreholes and reservoirs. The powers asked for were for parliamentary sanction to the works already carried out at Buckholt and Sweet Willow Wood; and, in addition, powers to go to Boreham Bridge to make boreholes and get additional water. They were merely asking for authority to give a supply in the additional area if required. Up to the present, they had spent £110,000, and they had authorized a further £50,000. They were now proposing to take powers to spend £172,000 upon gas and water extensions. At the present moment, they had very nearly reached the limit of their gas-producing plant. They would have to spend a very large sum on the gas and water works—particularly on the water-works; and the sum they were asking for would only meet the demand for the next twelve or fourteen years.

In a discussion as to the extension of the Company's area,

Mr. WILLIAMS said that the reason for the opposition was this: If the Bill meant only a permission to supply, there would be no objection to it. But the effect of including the area within the limits was practically to give the Company a monopoly; and so long as the Company were willing to supply the district, not even a Rural District Council could intervene.

Mr. BALFOUR BROWNE said if his learned friend would be satisfied, he would reduce the period from five to three years.

The CHAIRMAN said this was a good offer.

Dr. *J. Wills*, a member of the Corporation of Bexhill, gave evidence as to the necessity for a further supply of water.

Mr. *J. Quick*, the Engineer for the works included in the Bill, gave evidence. He said the daily consumption of water by the Company now averaged 450,000 gallons a day; but during the summer it went up to 700,000 gallons. The Company had just sufficient reserve to carry them through the maximum supply during the summer. When the works proposed in the Bill were completed, they would get double their present supply. The reservoir on Standard Hill would be able to supply Bexhill by gravitation, and also the additional area asked for in the Bill. They were proposing also to build reservoirs at Boreham Bridge and Sweet Willow Wood. The capital requirements for the proposed water-works would be £125,000.

Mr. *C. E. Hankins* said he knew the existing works of the Company, and had made a geological survey of the surrounding country on several occasions. He had selected the site for the Boreham Bridge well. The surface there was Wadhurst clay, and underlying that were the Ashdown beds.

Mr. *Wm. Whitaker*, F.R.S., said he had seen the sites of the proposed and existing works of the Company. The Boreham Bridge site was suitable for getting a good supply of water; and there would be no difficulty in obtaining it from the Ashdown beds. If 50 million gallons a day all the year round were pumped, not a drop would be taken from the wells at Ninfield. It was absolutely impossible, because the wells got their water from a higher and independent source, which was separated by 150 feet of clay. The surface wells were a risky supply; and if water could be got from the Company, owners would be wise to take it and shut up their wells.

After hearing local evidence and Mr. Williams on behalf of the East Sussex County Council, the Committee found the preamble of the Bill proved, subject to the tubbing of the boring wells so as to prevent surface water getting in, to the insertion of the ordinary clauses in respect to roads and bridges, and to the right of supply in the added district being limited to three years instead of five.

Tuesday, March 15.

On the consideration of clauses to-day, the Committee decided that the clause in respect to roads and bridges should be worded so that if an aqueduct were altered to enable the County Council to rebuild an existing bridge, it should be done at the Company's expense.

The Bill was ordered for report.

Metropolitan Borough Councils and the Gas Inquiry.—The Wandsworth Borough Council received last Wednesday a letter from the Board of Trade, in reply to a communication made to them with reference to the appointment of the Departmental Committee on London Gas. The Board stated that they could not now enlarge the terms of the reference; and when the Committee reported, it would be for Parliament to decide whether their recommendations should be extended to companies not subject to the provisions of the Metropolis Gas Acts. No action was taken on the matter.

Suicides by Gas.—A rubber tube fixed to a gas-burner was the means adopted for self-destruction in three cases of suicide reported last week. On the Monday morning, Thomas Everest, organist of St. James's Church, Kidderminster, was found dead, with the fatal tube beside him, and the whole house impregnated with gas. Deceased was at one time a Gas Manager in London, and was also for some years in business at Kidderminster as a Gas Engineer. He was a man of considerable musical and literary attainments. The same day, the Cheltenham Coroner held an inquest on the body of Henry Laughlin, coachman to Lady Baden-Powell, who was found dead with the end of a rubber tube from which the gas was escaping in his hand; and on Wednesday a man named Stephenson, who resided at Bradford, was discovered by his wife under similar circumstances.

Gas-Mains on a Railway Bridge; a Right of Way Dispute.—The Taff Vale Railway Company have given the Pontypridd District Council formal notice to remove their gas-mains from the Gelliwastad Bridge and its approaches within three months, and revoking any permission or licence that may have been given for laying them. The Company said they do not desire to put the public to the inconvenience, nor the town to the expense, of removing the mains unless they were compelled to do so in order to establish their rights as owners of the property. As, however, the fact that by permission of the Company the mains had been laid on the bridge, had been put forward in support of a claim to a right of way, it had become necessary to give this notice in order that the Company's position might be made clear. If the Council were prepared to enter into an agreement whereby the Company's rights were acknowledged, the Directors would doubtless allow the existing arrangement to continue. The Council consider the question of whether the road over the bridge is public so important that they have decided to take Counsel's opinion on the matter.

MISCELLANEOUS NEWS.

LEICESTER GAS, ELECTRICITY, AND WATER SUPPLY.

A Quarter-of-a-Century's Gas Supply.

At a Special Meeting of the Leicester Town Council held on Tuesday—the MAYOR (Alderman Sawday) in the chair—reports were presented by the Gas and Electric Lighting Committee and the Water Committee on the working of the undertakings under their charge during the half year ending the 31st of December.

The Gas and Electric Lighting Committee reported that the accounts of the gas undertaking had been submitted to them, from which it appeared that the net profit, after paying interest on the capital, was £31,075 15s. 10d. Out of this sum, there had been paid £7016 4s. 3d. to the sinking fund; leaving a balance of £24,059 11s. 7d. This, added to the balance of net profit (£14,006 14s. 4d.) for the half year ending June 30, 1903, made a total of £38,066 5s. 11d., which the Committee recommended should be applied to the district fund.

Mr. EDWARDS moved the adoption of the report and recommendation. He said that a year ago the Committee estimated they would make a profit of £20,000, instead of which it had been £38,065, which was a record profit for the Gas Department. The highest previously made was in 1899, when it was £30,236. The year 1903 completed 25 years of municipal control of the gas undertaking; and the result must be satisfactory to the Council and the town. During this time they had made a profit of £530,826, of which £6000 had been placed to the reserve fund, and £37,000 to the renewal fund, while £495,826 had been handed over in relief of the rates. This, to his mind, was a proof that municipal management was not the failure some people would have them believe. In the 25 years they had reduced the price of gas from 2s. 10d. to 2s. 4d. per 1000 cubic feet. The profits of the department with their present output, on the price charged by the Company, would be an extra £45,000 a year. In addition to this, they had abolished meter-rents, which would bring in £8000. This meant that they were handing over to the gas consumers of Leicester £53,000 a year in reduced charges. During the 25 years they had made £530,000 profit, and had handed over to the ratepayers £500,000 in reduced charges. The two together made £1,000,000, which was equal to the capital of the whole undertaking.

Mr. JENNINGS seconded the motion.

Mr. MANN thought the reserve fund of £6000 was not nearly so large as it should be on such an amount of capital. The Committee ought to increase that fund, especially in times like the present.

Mr. BIGGS, while congratulating the Committee on the report, failed to agree with the Chairman that the result showed the success of municipal administration. He had yet to learn that a monopoly, which could regulate its profits according to the market and demand, could prove anything but a success.

Mr. EDWARDS, in reply, said the Committee would be pleased to enlarge the reserve fund if only the Finance Committee intimated that they did not require any of the profit.

The motion was carried.

The Committee also reported that they had had the accounts of the electric lighting undertaking submitted to them, and that the result of the working was a net profit of £2948 12s. 2d. The profit for the half year ended the 30th of June last was £1301 15s. 11d.; making the total profit for the year £4250 8s. 1d.

Mr. EDWARDS, in moving the adoption of the above, said the net profit on the half year was an increase of £262. The policy of carrying forward the profits of the undertaking had proved a wise one, he thought they would all agree; for they had no idea of the length of life of their machinery. The department generally had been very successful. The consumption of current was going up by leaps and bounds, and month by month their increases were continuing. The department was thoroughly sound and successful.

Mr. JENNINGS seconded the motion.

Mr. YEARBY said he very much regretted that there was no recommendation in the report to abolish meter-rents; and he hoped the Committee would consider this very important matter before the end of the year.

Mr. EDWARDS said that during the last two years £2000 had been spent in renewals of meters, and the charges for current had been reduced from 6d. to 4d. per unit, which only left a small profit. He did not think, therefore, that this was the time to abolish meter-rents.

The report was confirmed.

The Water Committee reported that the net profit, after paying interest on the capital of the undertaking, was £9964 8s. 1d. Out of this sum there had been paid £3410 15s. 10d., the half-year's amount of the sinking fund; leaving a balance of £6553 12s. 3d. This, added to the balance of net profit (7670 4s. 1d.) for the six months ending the 30th of June, 1903, made a total of £14,223 16s. 4d., which amount the Committee recommended the Council to carry to the credit of the special water fund created under section 164 of the Derwent Valley Water Act, 1899. They further reported that, in connection with the Bill now being promoted by the Derwent Valley Water Board, clauses had been agreed upon for the protection of the Leicestershire County Council, the Corporation of Loughborough and the Trent Navigation, and inserted in the Bill.

Alderman WOOD moved the adoption of the report; and the motion was carried.

Increased Rating in South London.—A return presented to the Lewisham Borough Council on Wednesday showed that the rateable value of the property of certain private companies in the district had increased from £109,628 in November, 1900, to £121,482 in December, 1903. The Crystal Palace District Gas Company are rated at £16,719, against £13,078 in 1900; the Kent Water Company at £8641, against £6097; and the Lambeth Water Company at £4277, against £3700.

INCANDESCENT GAS LIGHTING IN STEPNEY.

At the Meeting of the Stepney Borough Council on Wednesday, the Works Committee reported that on the 28th of October last the Council accepted an offer of the Commercial Gas Company to fit street-lamps in the Borough with "Kern" burners. The Committee said they had for some time been endeavouring to settle with the Company the form of a contract for facilitating the working arrangements to be made for the purpose of giving effect to their proposals, but their efforts had not met with success. They had considered the matter in all its bearings; and, being desirous that the inhabitants of the borough should have the benefit of the improved street lighting which the adoption of the "Kern" burner would afford, they had deemed it advisable to instruct the Town Clerk to accept the Company's proposals without qualification. These were contained in a letter dated May 19, 1903, and signed by the Engineer (Mr. Stanley H. Jones). The Company will, at their own expense, fit up all the lamps in the principal thoroughfares at present not lighted on the incandescent system with No. 4 Kern burners of 100-candle power each; the rate to be for the first year-and-a-half £3 9s. per lamp per annum, as at present. By the expiration of that time, the cost of altering the lanterns will be recouped, and the rate will be reduced to £2 18s. per lamp per annum, to cover the cost of gas and maintenance. In the back streets, the Company will fit up No. 3 Kern burners of 50 to 75 candle power; the rate for the first year-and-a-quarter to be £3 9s. per lamp per annum, as now, and afterwards be reduced to £2 9s. per lamp per annum. The only stipulation the Directors made was that the Borough should continue to use the incandescent lamps when altered until the initial outlay had been recouped, which in the case of the No. 4 burners would be 18 months, and in that of the No. 3 burners 15 months. For the above-mentioned charges, the Company will renew the mantles when necessary, so that the illuminating power will be maintained. Mr. Jones pointed out that the offer, if adopted, would improve the public lighting to the extent of 400 to 500 per cent., with no immediate increase in the cost, and a large reduction at the end of 18 months. The Council passed a motion approving of the action of the Committee.

PUBLIC LIGHTING OF LYNN.

Electricity v. Gas.

At the last Meeting of the Lynn Town Council—the MAYOR (Mr. W. R. Smith) in the chair—a long discussion took place on the above subject, on a motion to the effect that, in order to avoid raising an additional loan of £11,500 for electric lighting purposes, the Gas Company should be invited to tender for lighting such parts of the borough as the Streets Committee might select, and thus render available for private lighting the current liberated.

Mr. T. BROWN, in proposing the motion, said he was impelled to do so by the feeling which actuated all the members, whether in their private capacity or as representatives of the ratepayers on the Council—viz., to obtain everything as cheaply and as efficiently as possible. As the rates on which loans would be granted by the Public Works Loan Commissioners had been raised, he thought he was justified in suggesting that, if the Council could go on for another two or three years without borrowing, they should do so. The Electrical Engineer had told him that the arc, incandescent, and Nernst lamps had, in round numbers, a total illuminating power of 23,000 candles, and they cost £1991 per annum. He had had an interview with Mr. Smithard, the Gas Company's Engineer and Manager, to ascertain what the Company would be prepared to do if they were asked to light the town with incandescent mantles; and he gave figures which showed that if a contract were made for a certain number of years, to fit up every standard in proper fashion, furnish them with suitable lamps, provide the mantles, and guarantee to keep them in order, do the lighting, and give a light of 38,825-candle power, at £1411 a year. This was £580 less than the present cost of lighting by electric current; and it was very close on a rate of 2d. in the pound. Assuming that they could double the light in the streets without any extra cost, it would be a wise thing to do; and if at the same time they saved a 2d. rate, surely that was wise also. This was not the only gain. They would avoid the additional loan, because at the present time 180,000 units were used for lighting the streets. Doing this with gas would liberate 70,000, 80,000, or 90,000 units; and this would be sufficient to tide them over for two or three years. He did not oppose the introduction of the electric light in the first instance; nor did he now entertain any prejudice against it. But if it had been foreshadowed that they were going to double the loan, and instead of £30,000 make it £55,000 and then £65,000 or £75,000, he should have felt he was bound to oppose it. He did not propose that they should disconnect all the street-lamps. If the Engineer thought they wanted 10,000 units, he (Mr. Brown) would suggest that they should ask the Streets Committee which streets they would advise should be lighted with gas, so as to release that amount of current; and if the next year he required 20,000 units, they would have to extend the gas lighting. The private consumer would then pay for the current hitherto used for street lighting; and the Council would meantime be economizing.

Mr. BRISTOW seconded the motion. Comparing gas and electricity for street lighting, he said he would ask any unprejudiced person to walk from one end of the town to the other, and then continue his walk through the docks, and give an unbiassed opinion as to which was the better of the two, although the lights on the docks were by no means so numerous as they were in the streets. But perhaps the most important point he wished to urge on the Council was the increased rating. When he joined the Council, the debt of the town was something like £60,000; ten years ago it had gone up to £77,000; five years ago it had increased to £123,000; and now it stood at £157,000. The annual interest and sinking fund for the town was something

more than £12,000, and meant a rate of 3s. in the pound. Adding to this the poor-rate, which was something like 2s. 5½d., they had two rates coming to 5s. 5½d.—sufficient in themselves, without adding all the others. If, therefore, they could get the streets lighted by gas, and save £580 per annum, surely they ought to consider whether it was not worth their while to have gas instead of electricity.

Mr. F. W. SAVAGE, referring to the cost of electric lighting, said the working expenses were £935 10s.; interest on lamps, £167; interest on the proportion of the generating plant used for public lighting, £116; repayment of principal on plant, post, lamps, and services £468—making the total actual cost £1686. Mr. Brown said the cost of lighting with gas would be £1411; but to this must be added interest on the cost of lamps and services, £167; and repayment of principal, £258—making the total cost £1836. So that the actual cost of the gas would be £1836, against £1219 as at present—a difference of £617 in favour of the existing system.

Mr. JERMYN said the Electricity Committee were only asking for an additional £5000; the remaining £6000 of the proposed loan had already been spent. He thought the electric lighting business was going to be a good paying concern; and he therefore urged the Council not to go back.

Mr. BUNKALL asked for information as to the cost of lighting the streets by electricity. Mr. Brown gave it at £1991; Mr. Savage gave it alternatively at £1686 and £1219. These figures were so widely divergent that he thought further information should be given.

Mr. SAVAGE said the working expenses and interest came to £1219, and repayment of principal to £468—making the total cost £1686.

The MAYOR: That £468 has to go on for 25 years.

Mr. PARSONS remarked that Mr. Brown, by mentioning £11,500 in his resolution, had included £6000 required to repay the bank.

Mr. BROWN said that what he wanted to save was the £5500. He recognised that the overdraft must be paid; and he amended his resolution accordingly.

Mr. PARSONS said he had always criticized the electric light undertaking; and he ventured to declare that if the criticisms of some of them with regard to the street lighting had been listened to, the position would not have been as it was now. The lamps had been condemned strongly in the Council; and if it had not been for the self-confidence of the members of the Electricity Committee that they knew more than everybody else, the town would not have been burdened with the light they had in the streets. The question, however, to his mind was whether they would not have to put up with it, bad as it was, rather than go in for a new departure, with the result of which they were uncertain. He was not convinced that to change now would be a wise thing, because he thought it might lead to a bigger cost than they had.

Mr. BROWN, in reply, said the Committee had spent unwisely; and he believed the boldest plan, and the most successful one, when they found they were wrong, was to retrace their steps and not send good money after bad.

On a show of hands the motion found only five supporters; and on a division it was lost by 17 to 6.

A CONSUMER'S TESTIMONY.

A striking illustration of the enormous differences in lighting power and cost of suitable gas and electrical means of lighting for business establishments is supplied from the experience of Mr. E. Crook, who carries on business in the High Street, Putney. He has submitted to the inspection of Moffat's Limited his lighting accounts for the quarter ending December, 1902, when he was using mostly electric glow lamps, and for the quarter ending December last, when gas alone was being used with Lucas and ordinary incandescent gas-lamps. It is seen that, under his new conditions, he gets three times the amount of light at one-third of the cost. The figures are as follows:—

Light obtained in 1902.

	Candle Power.
29 16-candle power electric glow lamps	464
9 ordinary incandescent gas-burners	360
	824

Light obtained in 1903.

5 400-candle power Lucas lamps	2000
10 ordinary incandescent gas-burners	400
	2400

Additional light, 1576-candle power.

Expenditure in 1902.

Electric current	£16 14 1	
New bulbs	2 5 0	
		£18 19 1
Gas consumed	£3 7 3	
Mantles	10 0	
		3 17 3
		£22 16 4

Expenditure in 1903.

Gas consumed	£6 10 10
Mantles	16 0
	£7 6 10

Saving in three months, £15 9s. 6d.

These figures, obtained from such an independent and unbiassed source, cannot but carry conviction to the most ardent opponent of gas lighting. This is recognized by Moffat's Limited, who have had them printed in circular form for distribution by gas suppliers who may care to have them.

OTTOMAN GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, No. 9, Queen Street Place, E.C.—Mr. STEPHENSON ROBERT CLARKE in the chair.

The SECRETARY (Mr. Thomas Guyatt) read the notice convening the meeting; and the Directors' report and the accounts were then taken as read.

The CHAIRMAN said he very much regretted, as he felt sure all the shareholders present would, that their Chairman was absent through ill-health. He knew that Colonel Daniell was very sorry that he could not be at the meeting. The figures that the Directors had to lay before the shareholders were so particularly good that it must be an especial disappointment to him not to be able to himself present the results to which he had so largely contributed. Though the public lighting was practically stationary, the private lighting for the half year showed an increase of £1150; and there was also a large increase in fittings, which, he trusted, promised well for the future. There was an addition of about £1800 to depreciation, renewals, and repairs, owing to the larger business requiring better facilities, larger mains, &c. There was also an exceptional item of £419 "loss on sale of Consols;" the investment having been transferred to Transvaal Three per Cents., so as to secure a larger income. A sum of £1100 had been placed to the credit of the depreciation fund, and now invested. After paying a dividend at the rate of 7 per cent. per annum on both classes of shares for the six months, there remained £2418 to carry forward. He was pleased to be able to announce that they had been able to secure an extension of the public lighting contract, which would now run for several years; and they had given to the private consumers a reduction in the price of gas from the 1st of January last, which would, the Board believed, be repaid to the Company by increased sales. He concluded by moving the adoption of the report and accounts.

Mr. H. W. ANDREWS seconded the motion.

Mr. F. W. CHURCH questioned whether it was absolutely necessary to sell the Consols, and make the loss of £419. And, further, whether the Directors did not think that the Consols would have righted themselves. The Company had a concession for 40 years; and he could not see there was any pressure for selling the Consols.

The CHAIRMAN said the Consols were sold and the Transvaal Three per Cents. bought about the same time. Any improvement that took place in Consols would equally occur in their new investment. Meanwhile, the Company gained a slightly better income, which, during the time their amortization fund had to run, would be very valuable.

Mr. J. REESON observed that in making the change in the investment the Directors had, as it were, written down the security. There had been a considerable depreciation in Consols; and he thought they might take it that really the amount had been written down to approximately the market value.

The CHAIRMAN replied that the investments now stood at about the value they bought them at.

Mr. HUGHES asked whether it would not have been advisable to have simply written the investment down as the banks had done. Regarding the War Loan, he thought they had something in it before, so that it must have been sold, and reinvested in the same loan.

The CHAIRMAN: No, no; only the Consols were sold.

Mr. ANDREWS remarked that they had this part of their investments all in one stock now—instead of some 2½ per cent. stock and some in 3 per cent. The Directors had practically only done what had been suggested as to writing down.

The motion was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. ANDREWS, a dividend at the rate of 7 per cent. per annum on both classes of shares was declared, free of income-tax.

The CHAIRMAN moved, and Mr. A. M. PADDON seconded, the re-election of the retiring Directors—Colonel Daniell and Mr. Andrews.

The motion having been heartily agreed to,

Mr. ANDREWS responded for himself and Colonel Daniell, who, he stated, was now abroad, and would receive with great pleasure, under the circumstances of his absence, this testimony of the shareholders' continued confidence. Regarding himself, he mentioned that he went to Smyrna in 1873 as the Engineer and Manager of the Company; and he was now happy to be on this side assisting the other Directors in the conduct of this most flourishing concern.

Proposed by Mr. CHURCH, and seconded by Mr. HUGHES, the Auditors (Mr. T. H. Cooke and Mr. A. W. Cooper) were re-elected at —on the suggestion of Mr. Hughes—the slightly increased fee of 15 guineas each per annum.

Mr. A. W. OKE moved a vote of thanks to the Chairman and Directors, remarking that the accounts were very satisfactory, seeing that, after paying the dividend and fixed charges, they had a very handsome balance. The Directors had also secured an extension of the public lighting for a considerable period; and they had been in a position to consider the consumers in the way of reducing the price. The future of the Company, like many other similar companies, seemed to be very satisfactory.

Mr. REESON, in seconding, said he could recollect the starting of the Company—now, he believed, some 40 years ago. It did not, so far as he remembered, make a very good beginning; and some of his friends thought it would be a failure. But it had been in good hands, and had since made excellent progress. He was glad to observe that the increase in the rental for the past half year amounted to over 7½ per cent., which was extremely satisfactory.

The CHAIRMAN, having replied, moved a similar vote to the chief officers and their staffs. He spoke of the zealous work of their Engineer and Manager in Smyrna (Mr. John Gandon), and of his exceptional ability and tact, which were useful qualities everywhere, and especially in a place like Smyrna. Mr. Guyatt they had with them; and they all knew how valuable was his work for the Company.

Mr. PADDON, in seconding, said that with some personal knowledge of what was required in the carrying on of gas enterprises in the Mediterranean and the vicinity, he could endorse what the Chairman had

said regarding Mr. Gandon. He was a man of exceptional merit, and he had an exceptionally difficult task to perform. In Mr. Guyatt, they had an exemplary officer, who gave them the full measure of his large experience.

Mr. GUYATT, in his acknowledgment, said he knew intimately of the labour that his colleague, Mr. Gandon, had gone through in the last few years; and, as they all knew by the results of the working, he had come out of it exceedingly well. The result of the past half year had been exceptionally good; and, so far as they were able to judge now, the current half year would be, if not better, equally good.

This concluded the proceedings.

GAS, WATER, AND GENERAL INVESTMENT TRUST.

The Utah Light and Power Company.

The report presented at the Annual Meeting last Tuesday of the Gas, Water, and General Investment Trust, stated that the net revenue for the year ending Jan. 28, after making provision for interest on debenture stock and all expenses, amounted to £14,809. To this had to be added the balance of £13,069 brought forward from the previous year's accounts, giving a total of £27,878. An interim dividend was paid for the half year ended July 28, at the rate of 4½ per cent. per annum, on the preferred stock, amounting to £7166; and the Directors recommended the appropriation of a further sum of £7213 to the payment of a similar dividend for the past six months—leaving a balance of £13,498 to be carried forward to next year's account. A dividend at the rate of 3 per cent. per annum was paid upon the deferred stock for the first half of the year, out of the reserve account for the equalization of dividends. In view, however, of the continued depressed state of the market for all securities, and of the unsettled outlook, the Directors did not think it prudent to further trench upon this fund at the present time. The loss on sales during the year, after deduction of the profits realized, was debited to suspense account; but the Trust held at the close of the financial year a considerable amount of securities received in lieu of interest, &c., for which no credit had been taken, and the Directors proposed that the proceeds of these, as realized in cash, should be credited in reduction of the suspense account. As a result of the general fall in the value of securities, those held by the Trust showed an increase in the depreciation as compared with the previous year.

In moving the adoption of this report, and the accounts, the Chairman (Mr. J. B. Braithwaite) pointed out that on the credit side of the balance-sheet investments stood at £947,534, compared with £928,465 in the preceding year, or an increase of about £20,000. Loans advanced figured at £55,452, as against £46,898, which was an increase of £8554. The suspense account for adjustment of securities was £226,397, as compared with £207,536. The total on the credit side of the balance-sheet was £1,250,408, against £1,216,479. On the other side of the account, the issued capital remained as before; while loans received stood at £161,337, compared with £109,870. As mentioned in the report, the net revenue for the year was £14,808, as against £15,781 for the previous year. It would thus be seen that the revenue was about £900 down; and he thought, considering the somewhat anxious period through which they had passed, it was satisfactory that they had been able to maintain their revenue at so nearly the same sum as in 1902. In the list of investments made by the Trust, gas and electricity figured at £387,190, and water at £49,965. The depreciation in market values which had occurred in the second half of last year had affected the Trust to the extent of £16,000 on the quoted securities. With regard to the unquoted ones, the best valuation they were able to make was £659,186, as against a cost of £598,538. This valuation was a decrease of £15,000 on the previous year. As to one of the concerns in which the Trust were largely interested—the Utah Light and Power Company—he might say that he visited Salt Lake City in the autumn of last year, and inspected the plant; and he was extremely pleased with everything he saw. They had a most capable staff there; and the earnings were continuing to show a very gratifying extension. For the first ten months of 1903 the receipts were $484,221, as against $416,383 in the previous year; and after expending upon maintenance, working expenses, and taxes, the net income amounted to $195,351. The surplus for the ten months referred to was $89,143, as compared with $66,903; and this surplus had, during the remaining two months—the best two months—of the year, been raised to $125,000. The most important event during the year in that city was that the electric street railways had amalgamated with the Light and Power Company; so that the Company now controlled not only the electricity and gas supply, but also the whole of the street railways, which brought in a revenue closely approaching their own. This amalgamation had greatly strengthened the position of the Trust's Salt Lake City investment, which local people were sanguine would in five years' time be paying a dividend on the ordinary shares. As to the dividend proposals contained in the report, he could not but think the shareholders would agree that, although they had the money available to continue to pay a dividend on the deferred shares for the past half year, it would, in view of the depressed condition of all markets, be very unwise to do this. They must set themselves steadily now to reducing the amount standing to suspense account, and endeavour to apply sums from revenue annually for this purpose, in addition to the money otherwise set aside with this object.

The report was adopted after the Chairman had answered several questions put by shareholders.

Fatal Accident at Birmingham.—While working on a scaffold at the Nechells Gas-Works, Birmingham, yesterday week, a foreman named Thomas Robinson fell to the ground, and received injuries to his skull and thigh. The unfortunate man was taken to the General Hospital, but succumbed two or three minutes after admission.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 749.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 15	10½	Alliance & Dublin 10 p.c.	19½—20½	+½	5 2 5
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
200,000	5	Nov. 12	6½	Bombay, Ltd.	5½—6	..	5 8 4
140,000	5	,,	6½	Do. New, £4 paid	4—4½	..	5 15 7
380,000	Stk.	Feb. 25	12	Brentford Consolidated	222—227	..	5 5 9
300,000	,,	,,	9	Do. New	167—172	..	5 4 8
50,000	,,	,,	5	Do. 5 p.c. Pref.	127—132	..	3 15 9
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb.	103—108	..	3 14 1
220,000	Stk.	Mar. 10	10½	Brighton & Hove Orig.	202—207*	..	5 3 10
246,320	,,	,,	7½	Do. A. Ord. Stk.	142—147*	..	5 5 5
460,000	20	Oct. 15	10	British	38—39	+½	5 2 7
100,000	Stk.	Feb. 25	6	Bromley, Ord. 5 p.c.	112—117	..	5 2 7
165,700	,,	,,	4½	Do. do. 3½ p.c.	85—90	..	5 0 0
500,000	10	Oct. 15	7	Buenos Ayres (New) Ltd	10¼—10⅝	..	6 10 3
250,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	91—93	..	4 6 0
150,000	20	Mar. 10	8½	Cagliari, Ltd.	21—23*	..	7 3 6
100,000	10	June 11	10	Cape Town & Dis., Ltd.	14—15	..	6 13 4
50,000	50	Nov. 3	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
1,375,000	Stk.	Feb. 25	5⅛	Commercial 4 p.c. Stk.	102—107	..	4 17 3
536,485	,,	,,	5	Do. 3½ p.c. do.	97—100	..	5 0 0
442,947	,,	Dec. 11	3	Do. 3 p.c. Deb. do.	84—87	..	3 9 0
800,000	Stk.	Dec. 30	7	Continental Union, Ltd.	103—108	..	6 9 8
200,000	,,	,,	7	Do. 7 p.c. Pref.	130—135	..	5 3 8
575,000	Stk.	Feb. 25	5⅛	Crystal Palace Ord. 5 p.c.	108—113	..	4 14 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	115—120	..	4 3 4
112,533	,,	Jan. 14	5	Do. 5 p.c. Deb. Stk.	134—137	..	3 13 10
486,090	10	Jan. 28	10½	European, Ltd.	18—19	..	5 10 6
354,060	10	,,	10½	Do. £7 10s. paid	13—14	..	5 12 6
15,243,200	Stk.	Feb. 11	4⅛	Gas- 4 p.c. Ord.	87—89	+1	4 18 10
2,600,000	,,	,,	3⅛	light 3½ p.c. max.	88—90	+1	3 17 9
3,799,735	,,	,,	4	and 4 p.c. Con. Pref.	104—107	+1	3 14 9
4,193,975	,,	Dec. 11	3	Coke 3 p.c. Con. Deb.	85—87	..	3 9 0
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	88—93*	..	5 7 6
70,000	10	Oct. 15	11	Hongkong & China, Ltd.	16—17	..	6 9 5
3,800,000	Stk.	Nov. 12	10	Imperial Continental	192—195	+1	5 2 7
473,600	Stk.	Feb. 11	3½	Do. 3½ p.c. Deb. Red.	97—99	..	3 10 8
165,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c.	103—108*	..	5 11 1
561,000	Stk.	Feb. 25	10	Liverpool United A	227—209	−2	4 15 8
718,100	,,	,,	7	Do. do. B	158½—160½	..	4 7 3
306,083	,,	Dec. 30	4	Do. do. Deb. Stk.	108—110	..	3 12 9
75,000	5	Dec. 11	5	Malta & Medn., Ltd.	4¼—4⅝	..	5 5 3
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	101—105	..	4 15 3
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	Nov. 12	3½	Monte Video, Ltd.	9—10	..	7 0 0
1,515,892	Stk.	Feb. 26	4½	Newc'tle & G'tesh'd Con.	106—108	..	4 3 4
406,025	Stk.	Dec. 31	3½	Do. 3½ p.c. Deb.	93½—94½	−½	3 14 1
300,000	Stk.	Nov. 26	8	Oriental, Ltd.	135—140	..	5 14 4
600,000	5	Sept. 30		Ottoman, Ltd.	5—6	..	5 16 8
					* Ex div.		
205,005	Stk.	Jan. 14	6½	Ply'mth & St'house 5 p.c	121—126	..	4 17 2
851,070	10	Oct. 15	7	River Plate Ord.	11½—12	+½	5 16 8
300,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	92—94	..	4 5 1
250,000	10	Sept. 30	7†	San Paulo, Ltd.	10½—11½	..	6 1 9
135,000	Stk.	Mar. 10	10	Sheffield A	236—258*	..	4 4 0
209,984	,,	,,	10	Do. B	235—237*	..	4 4 5
523,498	,,	,,	10	Do. C	234—236*	..	4 4 9
116,106	Stk.	Sept. 30	5	Shrewsbury Ord. 5 p.c.	109—112	..	4 9 3
6,150,000	Stk.	Feb. 11	5⅛	South Met., 4 p.c. Ord.	116—118	..	4 10 4
1,832,700	,,	Jan. 14	3	Do. 3 p.c. Deb.	85—88	..	3 8 2
380,940	Stk.	Nov. 12	5	Southampton Ord.	105—110	..	4 10 11
87,950	,,	Jan. 14	4	Do. 4 p.c. Deb.	100—103	..	3 17 8
120,000	Stk.	Feb. 25	6	Tottenham and Edmonton A. 5 p.c. B. 3½ p.c.	112—117	..	5 2 7
313,020	,,	,,	4½		93—98	..	4 11 10
182,380	10	Dec. 30	8	Tuscan, Ltd.	⅝—9	+⅛	8 17 10
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	97—99	..	5 1 0
745,872	Stk.	Mar. 10	5	West Ham, 5 p.c. Ord.	94—97*	..	5 3 1
				WATER COMPANIES.			
781,517	Stk.	Dec. 30	12	Chelsea, Ord.	350—355	..	3 7 7
150,000	,,	,,	5	Do. 5 p.c. Pref.	142—147	..	3 8 0
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	132—137	..	3 5 8
175,785	,,	Sept. 30	4½	Do. 4½ p.c. Deb.	132—137	..	3 5 8
1,720,560	Stk.	Oct. 15	8	East London, Ord.	220—225	..	3 11 1
654,740	,,	Dec. 11	4½	Do. 4½ p.c. Deb.	133—138	..	3 5 3
1,524,288	,,	,,	3	Do. 3 p.c. Deb.	87—90	..	3 6 8
700,000	50	Dec. 11	10	Grand Junction 10 p.c. max.	136—139	+1	3 11 11
310,000	Stk.	Sept. 30	4	4 p.c. Deb.	115—120	..	3 6 8
708,000	Stk.	Feb. 25	10	Kent	315—320	..	3 2 6
160,000	,,	,,	7	Do. New, 7 p.c. max.	215—220	..	3 3 7
1,043,800	100	Dec. 30	11	Lambeth, 10 p.c. max.	312—317	+1	3 9 5
406,200	100	,,	8½	Do. 7½ p.c. max.	227—232	..	3 13 3
150,000	Stk.	Sept. 30	4	Do. 4 p.c. Deb.	115—120	..	3 6 8
500,000	100	Feb. 25	10	New River, New Shares	375—385	..	2 11 11
1,000,000	Stk.	Jan. 28	4	Do. 4 p.c. Deb.	116—119	..	3 7 3
902,300	Stk.	Dec. 30	7½	South-wark and Ord.	274—279	+1	2 13 7
126,500	100	,,	7½	7½ p.c. max.	215—225	..	3 6 8
489,200	Stk.	,,	5	5 p.c. Pref.	144—149	+2	3 7 1
1,019,585	,,	Oct. 15	4	Vauxhall 4 p.c. A Deb.	115—120	..	3 6 8
1,155,066	Stk.	Dec. 11	10	West Middlesex	292—297	..	3 7 4
200,000	,,	,,	4½	Do. 4½ p.c. Deb.	130—135	..	3 6 8
200,000	,,	Mar. 10	3	Do. 3 p.c. Deb.	87—90*	..	3 6 8
					* Ex div.		

† Next Dividend will be at this rate.

FIRE AT THE STRETFORD GAS-WORKS.

The Town in Darkness.

Owing to an explosion which took place in the governor-room at the Stretford Gas-Works shortly after six o'clock last Tuesday evening, and a consequent outbreak of fire, the town and surrounding district were thrown into darkness, and for the remainder of the night the inhabitants were compelled to fall back upon lamps and candles for illuminating purposes. It is said that for a time the works were threatened with destruction; but fortunately the firemen eventually succeeded in confining the flames to a comparatively small area.

The chamber in which the governors are placed is in a two-storey building a few score yards distant from the retort-house and the gas-holders. Next to this chamber is the exhauster-room, and beyond this (in the same building) the engine-room. The second storey is used for storage purposes, and within it was a considerable quantity of oil. It is supposed that some gas escaping from one of the governors formed an explosive mixture, which was lighted by a jet photometer, so causing the explosion. The photometer is protected by wire gauze, and this must in some way have become defective. The gas exploded with great force, completely shattering the windows in the lower part of the building; and almost immediately the governor-room, exhauster-room, and engine-room were wrapped in flames, the fire soon mounting to the wooden roof and reaching the oil above. The Manager (Mr. H. Kendrick), who left the place a short time before the explosion occurred, was summoned; and under his directions the workmen endeavoured to check the fire by means of buckets of water from the mains. The gas supply was cut off, and the hose-cart from the Stretford Fire Station went to the works. The men, however, found their task considerably hindered by the insufficient pressure from the water-main. It was only when the Manchester brigade arrived that a plentiful supply of water could be obtained by means of the steamer from the adjoining canal. Every effort was directed to confining the fire to the building in which it had originated—and especially to preventing the flames from reaching an adjoining building, in which a large quantity of tar was stored. In this the firemen, after a short spell of hard work, were entirely successful.

The former building, however, was practically wrecked, and its contents destroyed or rendered useless; but happily nobody appears to have suffered any personal injury through the explosion or the fire, as the governor-room was empty at the time.

Mr. James A. Anderson, at present with Messrs. R. Addie and Sons, coalmasters, has been appointed chief representative for the new fire-clay works at Castlecary of Messrs. John G. Stein and Co., of Bonnybridge. The works at Castlecary have just been completed for the production of the highest class of fire clay goods.

SALES OF STOCKS AND SHARES.

At the Mart, Tokenhouse Yard, on Tuesday, Mr. Alfred Richards offered for sale, by order of the Directors, 350 "G" £10 ordinary shares in the Aldershot Gas and Water Company, and a like number of preference shares. The former rank for a maximum dividend of 7 per cent.; and, in view of the last dividends paid, they are entitled to the amount named. The latter are 5 per cent. shares. The ordinary shares fetched from £13 10s. to £13 15s. each; and the preference shares £10.12s. 6d. and £10 15s. apiece. He also placed another new issue, by the South Essex Water-Works Company. It consisted of £5000 of 5 per cent. ordinary stock, entitled to 4 per cent. dividend; and it sold for £101 and £101 5s. per £100 of stock. On the same occasion, he sold some £5 "B" shares in the Romford Gas Company (last dividend 9 per cent. per annum) at £8 10s. and £8 12s. 6d. each, *cum div.*; and a few £10 preference shares (5 per cent.) in the South-West Suburban Water Company at £11 15s. apiece, with the dividend accruing as from the 30th of September last. A few days ago, £936 worth of original 10 per cent. stock of the Faversham Gas Company, on which 7 per cent. has been paid, was sold in ten lots—seven of £100 each and the remainder of odd sums. The first £100 lot realized £140, and the other six £155 each.

GAS SUPPLY IN SHANGHAI.

According to the report presented by the Directors of the Shanghai Gas Company, Limited, at the annual meeting last month, there was a satisfactory increase in business in the year 1903; and the profit on the working account amounted to 144,126 taels, which was carried to the profit and loss account. The revenue from the sale of gas was 293,786 taels; and the total income, 366,307 taels. The expenditure was 222,181 taels. The balance at the credit of the profit and loss account, after deducting the amount of the interim dividend of 7 per cent. paid last July, and crediting the account with 5142 taels brought forward, was 115,427 taels; and it was disposed of as follows: Final dividend of 7 per cent. (making 14 per cent. for the year), 37,331 taels; bonus at the rate of 1·50 taels per share, 15,999 taels; written off depreciation of land and buildings, plant, &c., 29,549 taels; transferred to renewals and depreciation account, 25,000 taels. This left 7548 taels to be carried forward. There were 4675 tons more coal carbonized last year than in 1902, and 51,139,000 cubic feet more gas made. The consumption by private persons increased by 44,848,776 cubic feet, or at the rate of 24·26 per cent.; and for motive power by 19,519,800 cubic feet, or 47·51 per cent.—the number of engines in use being 81. The fittings department was fully occupied; a large portion of the staff being constantly engaged installing and maintaining incandescent

STETTIN (DIDIER) INCLINED SETTINGS

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gas-burners. Accompanying the report of the Directors was one by the Engineer (Mr. H. King Hiller), which furnished the following particulars: Coal carbonized, 24,452 tons; gas made, 263,398,000 cubic feet (yield per ton 10,731 cubic feet); gas sold, 238,163,476 cubic feet; gas unaccounted for, 22,354,024 cubic feet. The length of mains was increased last year by 13,344 yards, or 7½ miles.

THE MARYLEBONE ELECTRIC LIGHTING QUESTION.

The London County Council Prepared to Advance the Purchase-Money.

At the Meeting of the London County Council to day, the Finance Committee will submit a further report on the above-named subject. They review the proceedings of the Marylebone Borough Council which led to the promotion of the Bill now in Parliament, which contains clauses giving borrowing powers amounting to £1,881,444. It provides for the raising of money by mortgage of the general rate and the revenue of the electric light undertaking, or either of these securities, but without the sanction of the County Council; and it would give the Borough Council power to create and issue stock under the Local Loans Act, 1875. The County Council have petitioned against the Bill; and the Finance Committee have informed the Parliamentary Committee that, in their opinion, the clauses referred to should be amended so as to conform with the existing conditions under which the Metropolitan Borough Councils are empowered to raise money. The Borough Council have now asked the County Council, subject to the passing of the Bill, to undertake to advance a sum of £1,365,000 for the purchase-money and compensation payable to the Metropolitan Electric Supply Company, and have intimated that they will also apply for sanction to the borrowing, and for the advance, by instalments, of a further sum of £460,000, for the purchase of a site for the erection of buildings in connection with the undertaking, and the laying of mains, &c. The Finance Committee say they are strongly of opinion that the present system of finance, under which the County Council practically provide the funds required on loan by the local bodies of London, is the best in the interests of London as a whole; and they would view with grave apprehension any departure therefrom in the direction of the creation of separate local stocks. It has consequently been their policy to assist the Local Authorities by advancing loans to them at the lowest rate of interest possible without loss to the Council; thus giving them the benefit of the credit of the whole of London. Being anxious to continue this policy, and to uphold the present financial system, they have given the most careful consideration to the request of the Borough Council. In the present state of the Money Market, however, they are of opinion that it would be unwise to attempt an issue of stock; but they are so much impressed with the desirability, in the interests of London, of maintaining the principle of one central stock for all loans required, that they are prepared to advise the Council to seek powers in their Money Bill of this year to raise temporarily, in the event of the Borough Council's Bill becoming law, the loan of £1,365,000 by means of a special issue of London County Bills not exceeding £1,500,000. At a future date, when the financial situation becomes sufficiently favourable, the Council will replace these bills by stock, in order to provide for the permanent loan to the Borough Council. With regard to the money for new works, the Committee understand that the sum required during the year 1904-5 will probably not be more than £100,000; and this amount could be advanced out of the ordinary provision made by the Council for loans to Metropolitan Borough Councils.

METROPOLITAN WATER BOARD.

Impending Stock Issue—Management of the Undertakings.

A Meeting of the Board was held on Friday, at the offices of the Metropolitan Asylums Board—Mr. R. M. BEACHCROFT in the chair.

The Finance Committee reported that £440,000 would be wanted before the end of June, and that the Bank of England was prepared to lend it, on condition that it was repaid out of the proceeds of the first issue of stock by the Board, which is to be made through the Bank. The Committee recommended the acceptance of the Bank's offer.

Mr. PICKERSGILL referred to the condition which had been submitted, and said he noticed a disposition on the part of the Committee to pay too much respect to the Bank. They were not bound to get their advances from the Bank of England; and, under the present financial circumstances of the Board, he thought it would be most unwise to bind themselves to that establishment.

Mr. J. LIDIARD moved, as an amendment, "That the Finance Committee be requested to ascertain and report to the Board the terms upon which the Bank of England will undertake the issue and management of Metropolitan Water Stock."

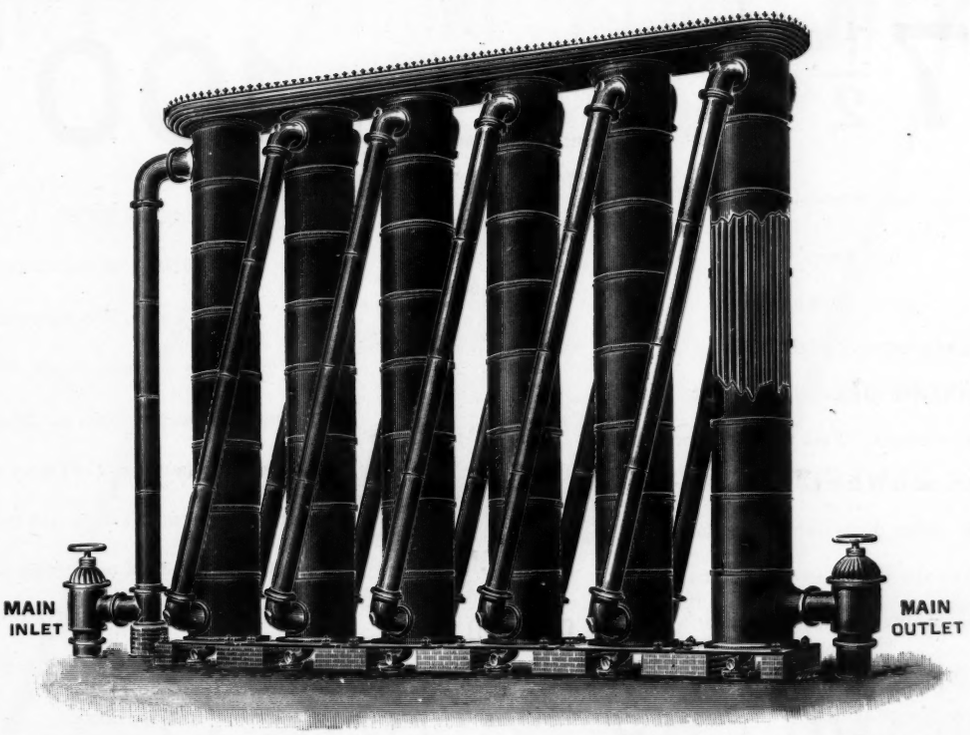
Lord WELBY, the Chairman of the Committee, accepted the amendment, which was then put as the substantive recommendation and agreed to.

The Special Arbitration Committee reported that the Finance Committee had submitted an estimate of £7000 for expenses in respect of the proceedings before the Court of Appeal and the House of Lords and of further matters to come before the Arbitrators; and they recommended its approval. They also recommended that they should be authorized to give notice of appeal to the House of Lords against the judgment of the Court of Appeal in the case of the New River Company, and to take all necessary steps in connection with the prosecution of the appeal. These recommendations were agreed to.

The General Purposes Committee submitted a long report as to the steps to be taken with a view to providing for the general management of the water undertakings, irrespective of the question of a more perfect system of management which might be created by degrees after

CONDENSERS.

WATER COOLING.



ATMOSPHERIC.

C. & W. WALKER, LTD., Midland Iron Works: DONNINGTON, SALOP. London Office: 110, CANNON STREET, E.C.

June 24, and which experience in the actual working of the undertakings might suggest. They submitted the following recommendations for approval: "(1) That the duty of general supervision be entrusted to the Chairman of the Board and the Vice-Chairman, who will report as may be necessary to the Committee concerned. (2) That the existing staffs of the Water Companies be retained on June 24; and that the General Purposes Committee report to the Board, after full investigation, all arrangements that may be required. (3) That the General Purposes Committee submit to the Board as soon as possible details of the method of working the undertaking on the general lines indicated in the report."

Some discussion took place on the first recommendation, in the course of which an amendment was submitted that it should be sent back to the Committee for reconsideration and report. This amendment was eventually carried by 20 votes to 19. The second recommendation was agreed to; while the third was referred back to the Committee.

DISPOSAL OF WATER PROFITS AT COLCHESTER.

At the Meeting of the Colchester Town Council on Wednesday, the Water Committee presented an estimate of receipts and expenditure for the half year from April 1 to Sept. 30, in which the estimated income from water rates and rents, &c., was £6859. Against this were set the expenses, interest on loans, &c., amounting to £5446, or £1413 less than the estimated income. The Committee resolved that the estimate be approved and placed before the Finance Committee, with a recommendation that £1000 out of the £1413 be placed to the credit of the next general district rate, and the balance (£413) carried to a special reserve fund, in order to cover any decrease of revenue in case it should be decided during the ensuing six months to make any reduction in the water-rate. Alderman Wicks having moved the adoption of the report, Alderman Watts moved an amendment to omit the clause referring to the £413, and it was carried. Thereupon Mr. Thompson Smith moved another amendment that the whole amount of £1413 be carried to a special reserve fund. He said that as the water consumers had been promised that they should have their rates reduced when possible, it was unfair that they should still be told that the profits of nearly £2000 were going to be grasped in the future, as in the past, without any reduction being made in the water charges. So long as these nest-eggs existed, and the Finance Committee could sieze them, so long would the rates be high. After discussion, the amendment was lost. Alderman Wicks next moved, as a further amendment, that the entire sum of £1413 be at the disposal of the Finance Committee. This, he said, would raise a distinct issue whether it should be appropriated to the general benefit or for the benefit of the present water consumers. Mr. Thompson Smith seconded the amendment, on the ground, as he explained, that if any money was to go to the rates let the whole amount go. The amendment was carried by 15 votes to 6.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday

The statutory annual meeting of the Edinburgh and Leith Gas Commissioners was held on Monday last. Bailie Bryson, the Convener of the Works Committee, reported that the Committee had that day accepted tenders for work in connection with the extension of the Granton station, amounting to £21,000. The Committee recommended the opening of two shops in Edinburgh and one in Leith for the purpose of exhibiting their goods and letting the public see what they could do in the way of lighting and heating, and also for the receiving of complaints and the giving out of orders. They had also before them a letter from the National Union of Gas Workers, complaining of what was done at the last meeting of the Commission with reference to the petition of the workmen in the retort-house at Granton; and they had agreed to recommend that no further action should be taken in the matter. They had also agreed to recommend that Sunday labour should be paid for as from six a.m. to six p.m. Bailie Douglas took exception to the matter of the opening of show-rooms. He did not think it was desirable that the Commissioners should enter into competition with plumbers and agents for incandescent lighting. He moved that before taking up this matter they should have a full report as to the necessity for opening such shops, and the annual cost of maintaining them. Bailie Bryson moved the adoption of the minute. It was, he pointed out, no new departure at all, because at the present moment they had four of these shops in existence. What was proposed was only an extension of the present system; and it was for the purpose of benefiting the public. The shops would be used as stores for the materials the men worked with in the various districts, so that they would not require to come to the centre of the city each time a complaint came in. In this way complaints would be much more promptly attended to. Sir Andrew M'Donald thought that, when they considered the acreage of the city, and the enormous trouble it was for men coming in to the central stores for everything they needed, it would pay them to have the branch shops. The Committee's recommendation was adopted by twelve votes to five. Bailie Bryson and Mr. Herring were instructed to look out for suitable shops, and to take them. With regard to complaints of smells from the Granton works, it was mentioned that those who had complained were to be asked to meet the Granton Works Sub-Committee in the works at the time when a purifier was being changed; and it would be reported to the Commissioners what took place at the conference.

Another attempt has been made this week to rush the Town Council of Glasgow into the position of being owners of coal mines. It is a subject which has been up before; but the good sense of the Corporation rejected it then, as it has done now. The mover in the matter was Bailie Shaw Maxwell, who is an ardent municipalizer. He would be told, he said, that coal was cheap and plentiful at the present moment. This statement would be conclusive if anyone could give assurance

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that there would never come a time of scarcity. He believed that before very long they would find themselves in a similar position to that which they occupied three or four years ago. During the dispute between the employers and the men, the increase in the cost of coal for the supply of their gas-works reached the incredible sum of £160,000 over the normal price. It was to save them from a similar dilemma that he proposed this resolution. There was one distinction between the Corporation and the ordinary coal merchant. The Corporation did not seek the supply for purposes of speculation, but for their own use; and therefore there would be no great risk. Seeing that they consumed coal to the value of £750,000 a year, he thought they would be quite justified in considering the subject. Mr. Russell moved the previous question. During the past forty or fifty years, for about two-thirds of the time the Corporation had been supplied with coal for the manufacture of gas at less money than they could have produced it—aye, at less than it was produced. A combination of circumstances, unlikely to recur in the lifetime of any member there, had caused an inflation in the price. The Corporation were made a "dumping-ground" not only by the producers of Lanarkshire coal, but also by producers in Fifeshire; and they would be able at all times to buy coal more cheaply than they would under the arrangement proposed. It was said that this step should be taken for the protection of the ratepayers; but if the Corporation continued to add to their enterprises in this way, there would be nothing left for the private trader. Mr. Gray said they had always had free competition among coal proprietors for their contracts; and, in these circumstances, there was no need for the motion. Mr. Paton pointed out that they would require to have pits in Lanarkshire, in Fifeshire, and probably also in Ayrshire, in order to get the best coal. But his experience, extending over twenty years, was that from all parts of the country there had been the strongest competition among coalowners to supply the Corporation. Some years ago they had to pay higher prices for coal; and on this account they had to raise the price of gas. If the Corporation had had collieries of their own, they would just as certainly have had to increase the price of gas, because the expense of raising coal would have gone up; and probably the increase would have been greater with them than with others. The motion was lost by 28 votes to 18.

In moving the adoption of the report of the Gas Manager, Mr. W. Ewing, at the meeting of the Greenock Town Council last Tuesday, Bailie M'Onie expressed regret that they were not entering upon an enjoyment of the economy that had been looked for; but he hoped that they were within hail of improvement. Mr. Swan thought it was about time they knew the reason for the unsatisfactory state of the gas-works. Mr. Mitchell agreed that it was very disappointing, and that the works were not producing the satisfactory results they used to do. The sooner the Committee got some satisfaction from the Manager the better. Bailie M'Callum suggested an explanation from the maker of the machinery. Mr. Mitchell replied that the Manager did not find fault with the machinery. There were plenty of managers who did not believe in stoking machinery; and Mr. Ewing seemed to be one of them. It was unfortunate that he should be forced to work the machinery, and equally so that the Corporation should have a man who did not wish to work it. Bailie M'Onie said it was only fair to state that the quantity of gas obtained per ton of coal in the past month was much better than in the preceding month. The quality of the gas had also improved since the previous month, when they had the lowest record for poor gas. It appears to be the absence of saving by the use of stoking machinery which is troubling the minds of the councillors. As to this, the Corporation have made their bed; and they must lie upon it. If they want the luxury of an up-to-date works, they can only have it by paying. They have paid, but not judiciously, because they did not go far enough—seeing that they attempted to work both upon the old and the new system.

It is announced that the Town Council of Falkirk and the North British Railway Company have practically arranged the matter of the railway siding to the new gas-works which the Corporation are about to erect at Thornhill, at a cost of between £50,000 and £60,000. The railway will serve the Falkirk and the Etna foundries as well as the gas-works; and provision is made for the future requirements of the district. There will be a level crossing upon Thornhill Road, with a bridge for pedestrians. It is understood that the proprietor of the Thornhill Estate is willing to feu out his lands, and that, in a few years, this district will be one of the busiest in the burgh.

The Witham Town Council on Monday adopted recommendations by the Gas Committee with reference to alterations at the gas-works. These include the provision of a Livesey washer of one million cubic feet capacity per day, a new steam-boiler, and a new pressure register and exhaust register, at an estimated cost of £550; also sulphate of ammonia plant, at an estimated cost of £1000. The Committee further recommended that repairs should be executed upon the other plant at a cost of about £200. The Manager—Mr. P. B. Watson—is to prepare plans and take in offers for the sulphate plant.

The Gas Committee of the Glasgow Town Council have received a deputation from the Town Council of Milngavie, with reference to the differential price of 1s. per 1000 cubic feet which is charged for gas supplied in the burgh both for public and private lighting. The Committee agreed to recommend the Corporation that the request made by the deputation be not entertained in the meantime.

The Dundee Gas Committee had a somewhat strange correspondence before them on Tuesday, with reference to the conveyance of coke, coal, and lime to and from the Corporation gas-works. Mr. A. Yuill wrote to the Manager of the Dundee and Arbroath Joint Railway, asking for a quotation of the rates for the traffic, and received a reply to the effect that, under agreement with the Caledonian and North British Railway Companies, they were prevented from hauling traffic between Dundee Harbour and any depôt or siding in Dundee. Mr. Yuill again wrote, asking if the agreement prevented them from taking coke from the gas-works to the harbour for shipment. The reply was that they could not undertake haulage on the Dundee Harbour lines, except of traffic received by rail for delivery at the harbour, or of traffic from

REPUTATION: Good name; the credit, honour, or character which is derived from a favourable public opinion.—*Nuttall.*

RICHMOND'S HAVE A WORLD-WIDE REPUTATION.

Advertisement of The Richmond Gas Stove and Meter Company, Ltd., Carpenter's Road, Stratford, and Academy Street, Warrington.

the harbour consigned to be forwarded by rail; and it was added that the Corporation should arrange to cart the traffic to the harbour. The distance is only a few hundred yards; but on account of the attitude of the Railway Companies, the Corporation require to forward all their coke for shipment by rail to Methie, in Fifeshire, at a cost of 2s. 6d. per ton. It is a peculiar position to be in, but surely the Corporation have the remedy in their own hands. The harbour belongs to the town, and not to the Railway Companies; and unless the Corporation have given away their rights to the Companies, is there any reason why they should not do their own haulage?

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 19.

Sulphate of Ammonia.

Demand has been sustained, and all parcels out for tender have been readily absorbed; but there has been no advance in values except on the East Coast, where there has been a slight improvement. Quotations at the close are £12 11s. 3d. per ton f.o.b. Hull, and £12 12s. 6d. per ton f.o.b. Liverpool and Leith. The market has still to depend upon Spain, the Colonies, and a moderate home demand for new business; shipments to the Continent being mainly in execution of old-standing contracts. There has been speculative selling abroad for March and April, at the equivalents of prompt prices; but otherwise the forward position has been neglected, the views of makers being out of reach of buyers.

Nitrate of Soda.

This article has been rather easier on the Continent; but locally the prices remain 10s. 3d. and 10s. 6d. per cwt. for ordinary and refined qualities respectively.

LONDON, *March* 18.

Tar Products.

The market for tar products has been decidedly quiet during the past week; and there has been a general absence of business. There is nothing fresh to advise in pitch. The market still continues very depressed, and does not show any signs of improvement, especially for forward delivery. Sales are reported on the Continent at very low prices for July-December; while in some instances business has been done up to the end of March, 1905, but at figures decidedly under those at present ruling here. There is certainly more pitch offering for April-June delivery; while one or two makers are prepared to sell up to the end of the present year. Continental consumers, however, appear just now to be somewhat indifferent as to the market; and prices in Belgium and the North of France rule very low indeed. There does not at present seem to be much hope of improvement in the article, as at this time of the year there is generally a fair quantity offering for early delivery; makers being anxious not to carry stocks over during the summer months. Benzol is decidedly quiet; and prices are again easier. Sales are reported in 90 per cent. at 10d. f.o.b. London for prompt shipment; while as regards 50-90 per cent., there is no business doing, and prices are purely nominal. In solvent naphtha, sales are reported at very low prices in the North of England, both for prompt and forward delivery; while in London there is an absence of business, either for home consumption or export. There is nothing whatever to advise in toluol; and consumers do not take the slightest interest in the article. Creosote is decidedly easier, and considerable quantities have lately been offering in the North of England, where business is reported at 1¼d. per gallon for prompt. In London, also, there has been a falling off in demand, and prices are easier; but there is no business of any importance to advise. There is rather more doing in anthracene, especially for forward; and some small contracts are reported to have been made for delivery over the present year at about current market prices. As to carbolic, it is really impossible to fix the value of this article, especially in crystals. London makers report sales at 7d. to 7⅛d., according to quality and periods of delivery; but against this, German makers have undoubtedly sold very recently at prices ranging from 6⅞d. to 7d., and there is still some quantity offering at about these figures. Crude is decidedly easier; and the demand from the Continent has certainly subsided. It would seem that Continental consumers have decided not to purchase further quantities just at present; believing that, with the cessation of the demand, prices will again go easier. Makers ask 2s. to 2s. 2d. per gallon for 60 per cent.; but consumers as a rule only offer 1s. 10d. to 1s. 11d., although there are no makers or dealers who will consider business at this figure.

The average values during the week were: Tar, 18s. to 23s. Pitch, London, 33s. 6d. to 34s.; east coast, 32s. to 33s.; west coast, 31s. to 31s. 6d. Benzol, 90 per cent., 10d.; 50-90 per cent., 7d. Toluol, 7d. Crude naphtha, 3d. to 3¼d.; solvent naphtha, 7d. to 8½d.; heavy naphtha, 10d. to 11d. Creosote, London, 1 1/16d. to 1⅛d.; North, 1¼d. to 1⅜d. Heavy oils, 2¼d. to 2⅜d. Carbolic acid, 60 per cent., 2s. Refined naphthalene, £5 to £7; salts, 22s. 6d. to 25s. Anthracene, "A" quality, 1⅜d. to 2d.; "B" quality, 1d. nominal. Light oils, 2¼d. to 3¼d.

Sulphate of Ammonia.

The market closes with a decidedly quiet tone; and there is an absence of business for either prompt or forward. Beckton do not report business, but would accept £12 15s. for March-April shipment. The South Metropolitan Company quote £12 17s. 6d. on their special terms, but are not able to do any business at this price. A little business has been done in Hull at £12 10s.; but the actual value may be taken as about £12 11s. 3d. for March-April shipment. There does not appear to have been any actual business at Leith, although makers report having declined £12 11s. 3d.; and they are asking £12 12s. 6d. in any position. In Liverpool, sales were made early in the week at £12 10s.; but £12 11s. 3d. is now reported to have been paid for prompt shipment.

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COAL TRADE REPORTS.

Lancashire Coal Trade.

At present, the coal trade of this district, with pits running about four to five days per week, is just about holding its own. House-fire requirements are being fairly well kept up, and generally the output in the better qualities of round coal is moving away, with prices about steady at late rates. Best Wigan Arley coals are still quoted from about 13s. to 14s. up to 14s. 6d. per ton at the pit in special cases, with lower qualities of Arley and Pemberton four-feet from 11s. and 11s. 6d. up to 12s. 6d., and common house-fire coals from 9s. and 9s. 6d. to 10s. 6d. The unsatisfactory industrial situation throughout Lancashire still seriously checks requirements for other descriptions of fuel. Common round coals used for steam and forge purposes remain in very indifferent demand; and although prices are without actually quoted change, the market is weak, and there is a good deal of low cutting to effect clearances, both on inland sales and for shipment. Common steam and forge coals could be bought at from about 7s 9d. and 8s. per ton at the pit, with the better qualities quoted at 8s. 6d. up to 8s. 9d. Ordinary steam coal is to be bought from about 9s. to 9s. 3d. per ton, with some of the better qualities quoted 9s. 6d. to 9s. 9d. delivered at the Mersey ports or the Manchester Ship Canal. The better descriptions of slack generally meet with a fairly ready sale; and prices for these are being well held to at late rates. Inferior sorts, however, are plentiful on the market, and have to be quoted very low to effect sales in competition with cheap slack offering from outside districts. Best Lancashire slack is steady at about 6s. to 6s. 6d. per ton, with medium sorts 5s. to 5s. 6d., and common descriptions obtainable at 3s. 6d. and 4s. upwards. Derbyshire slack can be bought at from 1s. 6d. and 2s. per ton upwards at the pit.

Northern Coal Trade.

There is a better demand for certain classes of coal; and prices are decidedly firmer, and in some cases higher. The steam coal trade, which was the most depressed, has naturally rather more of the recovery, because it benefits by the fuller Baltic trade which is now near. Best Northumbrian steam coals are 9s. 3d. to 9s. 6d. per ton f.o.b., second-class steams are 8s. to 8s. 3d., and steam smalls are 3s. 6d. to 3s. 9d. In gas coal, the demand is still fairly full for the home trade, and the exports now begin to show some improvement in volume; while new contracts are being booked, though not for very large quantities. For occasional cargoes, from 7s. 9d. to 8s. 6d. per ton f.o.b. is the current quotation for fair quantities of Durham gas coals. For contracts, the chief that have been reported of late are those for the Kiel gas supply, which is believed to have been taken at prices that may leave an average of about 7s. 9d. to 7s. 10d. per ton f.o.b. The heavier contracts for the South are now in course of negotiation at from 7s. 6d. to 8s. per ton f.o.b. Gas coke is fairly firm at from 13s. 6d. to 14s. 3d. per ton f.o.b. in the Tyne, for good qualities.

Scotch Coal Trade.

There is a better tone in the market, which arises from an improved demand for forward delivery. This is an experience which is the more gratifying in that the forward market has been the great weakness in the trade for the past year and more. Prices are not yet appreciably higher. They are quoted, per ton f.o.b. Glasgow, as: Main, 7s. 3d. to 7s. 6d.; ell, 8s. to 9s.; and splint, 8s. 6d. to 9s. The shipments for the week amounted to 193,596 tons—an increase of 24,566 tons upon the preceding week, and of 5619 tons upon the corresponding week of last year. For the year to date, the total shipments have been 1,775,665 tons—a decrease of 83,691 tons upon the same period of 1903.

High Wycombe Gas Company.—In the six months ending Dec. 31 last, the Company made 714,000 cubic feet of gas less than in the corresponding period of 1902, but sold 368,600 cubic feet more. This, in the present condition of the staple trade of the town, was regarded by the Chairman (Mr. G. Wheeler), when addressing the proprietors at the recent half-yearly meeting, as very pleasing, especially when taken in conjunction with the fact that the Company were subject to keen competition. The profits realized allowed of the payment of dividends at the rates of 7½ and 5¼ per cent. per annum on the ordinary and additional shares.

East London Water Company.—At the half-yearly meeting of the Company on Thursday, the accounts presented will show a decrease of £1576 on the revenue during the six months ending at Christmas, compared with the corresponding period of 1902; but, on the other hand, there was a drop of £27,015 in the expenditure. In their report, the Directors refer briefly to the alternative awards of the Arbitrators in connection with the transfer of the Company's undertaking to the Water Board, and to the appeals of the Companies now pending in the House of Lords. The balance applicable for distribution is £72,967, compared with £69,512; and the proposed dividend at the rate of 8 per cent. per annum will absorb £68,822 of it.

Price of Gas at Wrexham.—Referring at the annual meeting of the Wrexham Gas Company to the question of the price of gas, the Chairman (Mr. J. O. Bury) remarked that two important concessions had lately been made to consumers—viz., a further discount of 3d. per 1000 cubic feet for gas used for ordinary lighting, making the net price 2s. 9d., and the abolition of the rents hitherto charged for cookers used in connection with prepayment meters. In 1902, the Directors reduced the net price of gas used for motive power purposes to 2s. 3d. per 1000 feet; but until October last, no reduction in the price for ordinary lighting had been made for some years. If the undertaking continued its present prosperous career, he thought the consumers might reasonably anticipate a further reduction at no distant date. There was a balance at credit of revenue account at the close of the year of £6784, which allowed of the payment of dividends at the rate of 10 and 7 per cent. on the stock and shares respectively.

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BLACKBURN.	1,250,000	ST. CATHERINES (Remodelled)	250,000	ACCRINGTON.	500,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	TONBRIDGE	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	STRETFORD	500,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	OLDBURY	300,000
BIRKENHEAD	2,250,000	ST. CATHERINES (Second Contract)	250,000	TODMORDEN	500,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	YORK (Second Contract)	750,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	ROCHESTER (Second Contract)	500,000
HALIFAX	1,000,000	YORK	750,000	NEWPORT (MON.)	250,000
TORONTO	250,000	ROCHESTER	500,000	TOKIO, JAPAN	1,000,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	PERNAMBUCO (Brazil)	125,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	MALTON	150,000
MONTREAL	500,000	DULUTH, MINN.	300,000	DULUTH, MINN. (Second Contract)	300,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	BROCKVILLE (ONT.)	250,000
BELLEVILLE	250,000	LEICESTER	2,000,000	SMETHWICK	500,000
OTTAWA (Second Contract).	250,000	ENSCHEDE (HOLLAND)	150,000	GRAVESEND	300,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT MON. (Second Contract)	250,000
		BURNLEY	1,500,000	TORONTO (Third Contract)	750,000
		KINGSTON-ON-THAMES	1,750,000	TORONTO (Fourth Contract)	1,000,000

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LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.
MONTREAL, ONT. (Second Contract), 1,800,000 C. Ft. HAMILTON, ONT., 400,000 C. Ft.

Reductions in Price.—The Harrogate Gas Company have reduced their price 2d. per 1000 cubic feet as from the beginning of the year. The St. Helens Town Council have sanctioned a reduction of 3d. per 1000 cubic feet in the price of gas supplied through slot meters. The Wisbech Gas Company announce a reduction of 3d. per 1000 cubic feet as from the 1st prox. The Directors of the Ramsbottom Gas Company have decided to reduce the price of gas for lighting purposes by 1d., and for engines and cookers by 2d., per 1000 cubic feet

The Southport Gas and Water Undertakings.—The Chairman of the Southport Corporation Gas Committee (Mr. E. Trounson) has prepared some statistical information with reference to the gas and water undertakings. It shows that last year the former furnished £8000 towards the reduction of the rates, and, in addition, wiped off an accumulated deficit amounting to about £2000. Southport had had a new rate to pay in connection with the Water Board—a sum equal to a 4½d. rate—and no immediate reduction could be looked forward to. The readjustment of the water charges made last year had, however, resulted in a saving of about £2000 per annum to the consumers.

Quality of Walsall Gas.—Some conversation with regard to the quality of the gas supplied at Walsall took place at last week's meeting of the Town Council, when Dr. Shore drew attention to the Gas Committee's report, which showed the illuminating power to be 14·75 candles. He asked if there was any connection between the decrease in the quality of the gas and the decrease in the price of it. To this Alderman Brownhill replied that there was no intention to reduce the quality now the gas was cheaper. It was a calumny on the Committee to accuse them of deliberately lowering the quality of the gas to make a little profit. Mr. Pearman-Smith thought it a great shame that people should be put to the expense of installing and pulling out fittings to please the Committee; but another member said the number of complaints now was not half as large as a year ago.

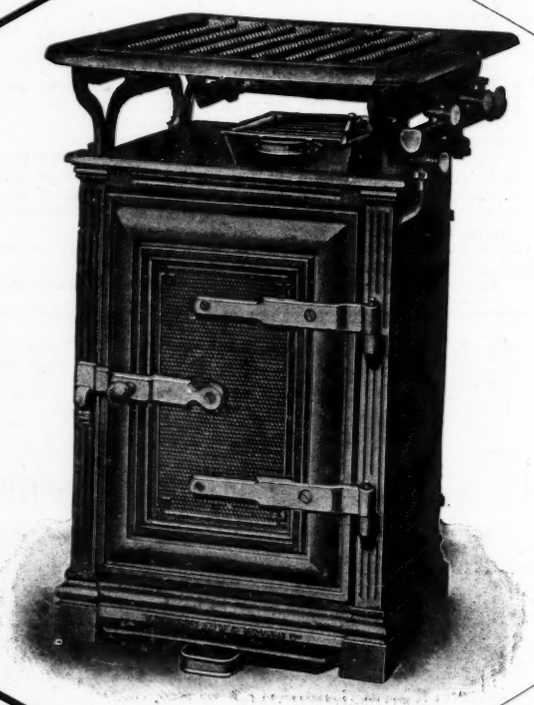
Lecture on Carburetted Water Gas.—At the last meeting of the Burnley Literary and Scientific Club, Mr. Raymond Ross, F.I.C., F.C.S., gave an interesting illustrated lecture on the subject of carburetted water gas. He explained the leading systems for producing it, and said he thought there was no more danger in using water gas than in burning coal gas. In Burnley, the danger was reduced to a minimum by the inspection of new gas-fittings and the testing of all fittings. There was perhaps no town in England where more care was taken in this respect. In the discussion which followed, Mr. J. P. Leather, the Gas Engineer to the Corporation, explained the working of the plant which had been put up for the manufacture of carburetted water gas at Burnley, and the method of enriching coal gas. He said that if legislation took place on the lines of the report of the Departmental Committee of the Home Office, they would in Burnley not have to alter their method of working.

Incandescent Church Lighting at Eastbourne.—The Eastbourne Gas Company have just fitted up Christ Church with incandescent gas-lamps, in place of flat-flame burners. The old system of lighting consisted of 154 burners, which consumed nearly 900 cubic feet of gas per hour, at a cost of 2s. 5d. The new installation comprises some 53 burners, which consume about 225 feet of gas at a cost of 7d. per hour, besides greatly increasing the illuminating power. There are 42 large type inverted lamps. The arms of the existing pendants have been turned downwards; one lamp being attached to each arm, displacing in each case three large flat-flame burners. Similarly, the brackets upon which hitherto twelve flat-flame burners have been fixed have given place to three inverted lamps and one ordinary incandescent burner. It is estimated that, taking into account the increased cost of maintenance, there will be a clear annual saving of nearly £8, as well as a marked improvement in the hygienic conditions of the church.

"Eveson v. Cash" Actions at the Birmingham Assizes.—The "Birmingham Gazette" for Saturday gave the following report of two cases set down for trial at the Birmingham Assizes: "The action of the Eveson Coal and Coke Company, Limited, *v.* Thomas Cash, which was entered for trial with a Special Jury, was settled; and Mr. Leslie, on behalf of the plaintiffs, informed the Court that terms had been arranged, under which judgment was to be entered for the plaintiffs for £100 damages and costs, and his Lordship ordered judgment accordingly. A further action brought by G. J. Eveson against the same defendant, Mr. Leslie informed the Judge, had been settled on similar terms as the previous action; and judgment was given for the plaintiff for £100 and costs." By the actions here referred to, the plaintiffs' solicitors inform us, damages were claimed against defendant for breach of agreement for employment; plaintiffs alleging that defendant, while in their employ, wrongfully obtained orders for coal and tubes for other persons and companies, and had received commissions.

Fatal Gas Poisoning in Belfast.—An inquiry was held last Tuesday into the circumstances attending the death of Eliza Bowden, of No. 9, Ardgowan Street, Belfast. On the night of the 25th ult., a plumber went to the house to do some gas-fitting work, and left at about 11.30. The family, consisting of the deceased and her two daughters, retired about midnight. On rising in the morning, one daughter found her mother and sister in a state of unconsciousness in their room. Medical assistance was called, and the women were removed to the Royal Hospital. They remained there till the 9th inst., when deceased was removed, at her own request, to No. 40, Templemore Avenue, where, according to the medical evidence, she died two days later from congestion of the lungs and cardiac failure following gas poisoning. The younger woman recovered. Mr. M'Devitt, the plumber who did the work, stated that when he had finished he applied the usual test of a light. He removed two brackets over the mantelpiece, as he was requested to do so; but he was not asked to examine the pipes through the rooms upstairs. Mr. Clelland, the Chief Inspector of the Gas Department, said he went to the house and found an escape in the pipe leading to the hall lamp, and also two escapes in the pipe under the floor of the bedroom in which the women had slept. One was made, he thought, by a nail, and the other by a mouse. The piping was of very poor quality, and had been very badly laid—a very common thing in houses of this kind. The Jury returned a verdict in accordance with the medical evidence, and did not attach blame to the plumber or anyone else.

PARKINSON'S SLOT COOKERS.



NEW DESIGNS.

Particulars on Application.

PARKINSON AND W. & B. COWAN, LTD.
(*Parkinson Branch*),
COTTAGE LANE, CITY ROAD, LONDON.
BELL BARN ROAD, BIRMINGHAM.

The Chester Gas Company have adopted the Jäger patent purifier grids and appliances, for which Messrs. Samuel Cutler and Sons, of Millwall, are the sole licensees and manufacturers.

The Peterhead Town Council last week adopted a recommendation by the Gas Committee that new condensing and scrubbing plant be erected in the gas-works; and they accepted the offer of Messrs. Henry Balfour and Co., Limited, of Leven, Fife, to do the work at the price of £279.

The Burnley Corporation and the Chigwell, Loughton, and Woodford Gas Company have placed orders with Messrs. W. C. Holmes and Co. for improved patent "New" scrubber-washers for ammonia extraction; and the firm have received from the Ipswich Gas Company a repeat order for two of these machines.

Messrs. Kirkham, Hulett, and Chandler, Limited, have received orders from the Sunderland Gas Company and the Nottingham Corporation for their improved patent "Standard" washer-scrubbers; the machines being for 3 million and 2½ million cubic feet of gas per day respectively. The firm have also recently received an order for one of their patent "Standard" condensers for the Danish Gas Company.

Messrs. R. Laidlaw and Son, Limited, have secured an order from the Edinburgh and Leith Gas Commissioners for an exhauster to pass 750,000 cubic feet of gas per hour, with disc valves, gas-engine, and frictional gearing complete, to be the same as the two sets recently supplied and erected by them at the pumping-station at the Granton Gas-Works. They have also just completed the erection, at the Nechells works of the Birmingham Corporation, two sets each composed of two exhausters and horizontal tandem compound non-condensing steam-engine, with gas bell regulators and automatic speed-governing arrangements, the same as the two sets supplied by them a few years ago; making a total capacity of exhausting plant furnished and erected by them at these works of 1,200,000 cubic feet of gas per hour.

The first report of the Directors of the New Inverted Incandescent Gas-Lamp Company, with the accounts for the fifteen months ending Dec. 31, has been issued. They state therein that the net trading profit, after allowing for depreciation and all trade charges, is £9664. After making other adjustments, as shown in the profit and loss account, the balance of profit amounts to £8371, which the Directors recommend should be carried forward with a view to strengthening the resources of the Company. The amount due on bills payable represents bills given by the Company to the Inverted Incandescent Gas-Lamp Syndicate in part payment of the purchase price of the patents acquired from them; the Company having exercised the option they had under their agreement with the Syndicate to make part payment in this way. Since December, a payment has been made to the Syndicate in reduction of the Company's liability in this connection.

At the first annual meeting of Messrs. Bruce Peebles and Co., Limited, to-morrow, the accounts to be presented will show that the net trading profit for the year ending Dec. 31, including interest and dividends received, and transfer fees, amounted to £17,125, which, after deducting £6125 for Directors' fees, Managing Directors' salaries, income-tax, and interest to vendors, leaves a balance of £11,000, which the Directors recommend should be disposed of as follows: In paying a dividend at the rate of 6 per cent. per annum (less income-tax) on the preference shares, £2497; in paying a like dividend on the ordinary shares, £2359; in carrying to a special reserve fund a sum of not less than 10 per cent. of the net profits, £1750; in carrying to a general reserve fund £1250; in writing off preliminary expenses £2000—leaving to be carried forward a balance of £544. In their report, the Directors point out that the profit earned is better than the previous year. This they consider satisfactory, in view of the general depression of trade, the consequent reduction in prices, and the fact that the whole of the year's work was carried out in the old premises. The new works at East Pilton are now running, and the Directors expect that a considerable saving will be effected thereby

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.
SECRETARY. Southampton Gas Company. March 26.
SECRETARY. Reading Gas Company. March 26.
DRAUGHTSMAN. No. 4183.
DRAUGHTSMAN. Nottingham Gas Department. Applications by March 31.
CLERK. Nottingham Gas Department. Applications by March 31.
GENERAL ASSISTANT (MIDLANDS). No. 4184.
FOREMAN FITTER. Waterford Gas Company.

Situations Wanted.
ASSISTANT-MANAGER. No. 4178.

Plant, &c., for Sale.
CONDENSER (250,000 feet). Redditch Gas-Works.
ENGINES AND EXHAUSTERS. Slough Gas Company.
EXHAUSTER AND STEAM-ENGINE. Brecon Gas Company.
GASHOLDER. R. Dempster and Sons, Elland.
STATION METER AND GOVERNOR. Williams and Co., Stoke-on-Trent.
STATION METER. Mansfield Gas Department.
STATION METER. Tunbridge Wells Gas Company.
WATER-WORKS PUMPING PLANT, &c., ENGINES, AIR COMPRESSOR, &c. Wallasey Urban District Council.

Company Meeting.
BRITISH GASLIGHT COMPANY. Offices, March 30. Twelve o'clock.

Sales of Stocks and Shares.
HASTINGS AND ST. LEONARDS GAS COMPANY. April 12.

Shares Wanted.—Martin, Streatham.

TENDERS FOR

Benzol and Carbolic Acid Plant.
GLASGOW GAS DEPARTMENT. Tenders by March 29.

Coal.
COMMERCIAL GAS COMPANY Tenders by March 20.
CONGLETON GAS DEPARTMENT. Tenders by April 5.

Coke Breeze.
SWANSEA GAS COMPANY.

Oil for Gas Making.
CARLISLE GAS DEPARTMENT. Tenders by March 24.

Oxide of Iron.
CARLISLE GAS DEPARTMENT. Tenders by March 24.

Pipes and Specials, &c.
DEVONPORT GAS DEPARTMENT. Tenders by March 31.
RADCLIFFE AND PILKINGTON GAS COMPANY. Tenders by April 1.

Railway Construction.
WALLASEY GAS DEPARTMENT. Tenders by April 20.

Tar and Ammoniacal Liquor.
BELFAST GAS DEPARTMENT. Tenders by April 14.
CARLISLE GAS DEPARTMENT. Tenders by March 24.
HAWORTH URBAN DISTRICT COUNCIL. Tenders by March 24.

Weighbridge, &c.
WALLASEY GAS DEPARTMENT. Tenders by April 20.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."
United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in Advance. If credit is taken, the charge is 25s. a year.
Abroad (in the Postal Union): £1 7s. 6d., payable in Advance.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE has a larger annual sale than all other Oxides combined.

SPENT OXIDE purchased in any district.

GAS PURIFICATION & CHEMICAL CO., LD.

JOHN WM. O'NEILL, Managing Director,

PALMERSTON HOUSE, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London E.C. "Volcanism, London."

SULPHATE OF AMMONIA
SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.
For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."
Largest Practice and most Up-to-Date Works in Britain.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

DUTCH OXIDE OF IRON.

THE First Dutch Bog Ore Co., Ltd.,
(Eerste Hollandsche Yzererts Maaty), ROTTERDAM.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.
London Managers—
E. PADFIELD & CO., 93-98, Leadenhall Street, LONDON, E.C.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

OXIDE OF IRON.
(NATURAL.)

BALE & CHURCH will be pleased to send Samples and Quotations, and make Offers for SPENT OXIDE.

BALE'S FIRE CEMENT, PAINT, AND GAS COAL.
5, CROOKED LANE, LONDON, E.C.

COAL GAS TAR wanted.
BEST PRICES GIVEN.
SHARPNESS CHEMICAL COMPANY, LIMITED, Sharpness Docks, GLOS.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

SPENCER, CHAPMAN, AND MESSEL, LIMITED, 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

TO GAS AND WATER OFFICIALS.

MELROSE CYCLES and Slot Copper COLLECTORS. Latest Design and lowest Prices. For Cash or gradual payments. Catalogue free.
MELROSE CYCLE COMPANY, COVENTRY.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PATENTS AND TRADE MARKS PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
SURREY ENGINEERING WORKS, BLACKFRIARS ROAD, LONDON, S.E.
Telephone: 1693 HOP. Telegrams: "LUMINOSITY."

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

ATTERTON'S Patent Charging Machine, especially adapted for Small Works up to 50 Millions. Nearly 40 already supplied, and still supplying. Would soon repay for small outlay. Increased make and reduction in cost.
Apply to E. PADFIELD AND CO., 96 & 98, Leadenhall Street, LONDON, E.C.

GAS EXHIBITIONS.

A. E. PODMORE & CO. will be pleased to make arrangements to lend their High-Power, Low-Pressure, Recuperative Incandescent Gas-Lamps, BURNERS DUST AND INSECT PROOF, to Gas Companies holding Exhibitions.
This Lamp having no wearing parts to get out of order, is the most suitable for the Hire-Purchase System. Electric Light Eclipsed. 25A, HATTON GARDEN, E.C. Telephone 6630 CENTRAL. Telegrams: "PROMEROPE, LONDON."

SPENT OXIDE.

THE South Metropolitan Gas Company are always open to receive OFFERS of SPENT OXIDE.
Chief Office: 709, Old Kent Road, London, S.E.
Telegrams: "METROGAS, LONDON."

APPOINTMENT wanted as Assistant-MANAGER in Gas-Works. Trained at Engineering Works. Recently prepared Drawings and Superintended erection of large up-to-date Gas-Works. Good knowledge of Chemistry and Gas-Works Routine. Honours Gas Manufacture.
Address No. 4178, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CITY OF WATERFORD GAS COMPANY.

FOREMAN Fitter wanted, to superintend Fitters' work and Advise Consumers. Must be well up in Main and Serviceing, Gas Engines, interior House Fitting, including Fires, Cookers, Geysers, &c.; also Incandescent Lighting, public and private, High and Low Pressure Systems. Good opening for smart, capable Man. Wages £2 per week.
Apply, in own handwriting, stating Experience, Age, &c., to Mr. J. G. TOOMS, Manager, Gas-Works, WATERFORD.

THE Manager of a large Midland Gas-Works, now carrying out important Extensions, requires the services of a Young Man as GENERAL ASSISTANT. Must be a good Draughtsman, and also have had previous training in a Gas-Works, and be able to carry out the various Laboratory Tests, &c.
Salary, £100 per Annum.
Apply, stating Age, with full Particulars of Experience, to No. 4184, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Draughtsman used to Inclined Retort Structural Work.
Apply, by letter, to No. 4183, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Nottingham Corporation Gas Department require the services of an experienced DRAUGHTSMAN, accustomed to Gas-Works Plant, and capable of taking out quantities, strains, &c.
Applications, endorsed "Draughtsman," stating Qualifications, Age, Experience, and Wages required, accompanied by *copies* only of three recent Testimonials, to be sent in to the undersigned not later than the 31st inst.
J. H. BROWN,
Engineer and General Manager.
Gas Offices; 6, George Street,
Nottingham, March, 1904.

THE Nottingham Corporation Gas Department require the services of a smart, intelligent Man as CLERK in the General Manager's Offices, at a salary of about £160 per Annum.
Applicants must be quick and accurate at figures, and have a fair knowledge of Mathematics, and have had previous Experience in Gas Accountancy, and be capable of preparing Financial Estimates, Forecasts, and General Statistics. A knowledge of Gas Manufacture would be considered an advantage.
Applications, stating Age, Experience, and Salary required, endorsed "Clerk," to be addressed to the Chairman of the Gas Committee, 6, George Street, Nottingham, not later than the 31st of March, 1904.
J. H. BROWN,
Engineer and General Manager.
Gas Offices; 6, George Street,
Nottingham, March, 1904.

SOUTHAMPTON GASLIGHT AND COKE COMPANY.

APPOINTMENT OF SECRETARY.

THE Directors of this Company are desirous of receiving APPLICATIONS for the appointment of SECRETARY to this Company from Candidates who have had practical experience in such an office. No application will be considered from anyone who has not had such experience.
Applications to be sent in not later than the 26th of March, accompanied by four recent Testimonials, addressed to the undersigned.
The person appointed will have to devote the whole of his time to the office.
Commencing Salary, £400 per annum.
Applicants to state at what date they could commence the duties.
Notice will be sent to selected Candidates.
The appointment will be made on the 6th of April.
By order,
C. CROWTHER SMITH,
Secretary.
Ogle Road, Southampton,
March 2, 1904.

READING GAS COMPANY.

APPOINTMENT OF SECRETARY.

THE Directors of the Reading Gas Company invite APPLICATIONS for the vacant post of SECRETARY to the Company.
The Secretary will have the control of the Staff at the Central Offices, and, in addition to the usual secretarial duties, he will be responsible for the proper keeping of the accounts of the Company.
Candidates should make applications in their own handwriting, stating Age, Qualifications, and Salary expected, with not more than three recent Testimonials as to character and abilities.
Preference may be given to Candidates who have had Experience in Gas Accountancy and Administration.
Applications must be received not later than Saturday, March 26, 1904; and they should be addressed to THE CHAIRMAN, The Gas Company's Offices, King Street, READING.

FOR SALE—A 40,000 cubic feet Station METER, by Wright.
Further Particulars on application to the ENGINEER, Gas-Works, TUNBRIDGE WELLS.

CONDENSER for Sale. In splendid Condition. Cheap. Capacity 250,000 Cubic Feet per Twenty-four hours.
Apply to A. E. LAYTON, Manager, Gas-Works, REDDITCH.

TO BE SOLD—New Single Gasholder, 50 feet diameter by 15 feet deep, with Six Wrought-Iron Standards, top Ties, and Suspension Gear if needed. Ready for erection.
Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

FOR SALE—A 500-Light Wet Cylindrical STATION METER, with Cast-Iron Cradle. Complete with Three 6-inch Valves and Connections. Practically new.
Apply ARTHUR GRAHAM, Gas and Water Engineer, MANSFIELD.

FOR SALE—One Station Meter, 5 feet diameter, by Braddock, with 6-inch Valves. Also One Braddock GOVERNOR, with 7-inch Inlet and Outlet Pipes, Bye-Pass, and Valves.
Apply to H. J. WILLIAMS AND CO., Kidsgrove, STOKE-ON-TRENT.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill DEWSBURY.

ROBERT DEMPSTER & SONS, Ltd. Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

TO SUBSCRIBERS.

ROBERT DEMPSTER & SONS, LTD., of Rose Mount Iron-Works, Elland, Yorkshire, beg to inform Subscribers to the "JOURNAL OF GAS LIGHTING," that the series of COLLOTYPE VIEWS OF GAS PLANT executed by them is being issued in the form of inserted sheets fortnightly, Five of which have already been published, and respectfully suggest that SUBSCRIBERS SHOULD PRESERVE THE WHOLE SERIES FOR FUTURE REFERENCE.

WANTED to purchase Gas Shares Stock, or Debentures of any good dividend-paying Company; also Water-Works Shares and Debentures. Size and location of Company immaterial. Securities that have failed to realize reserves at auction considered.
Address MR. MARTIN, 41, Shrubbery Road, Streatham, LONDON.

WANTED, good Gas Apparatus:—
CONDENSER, 8-inch Pipes, Vertical or Horizontal, former preferred.
SCRUBBER TOWER, Washer in bottom an advantage, about 5 ft. by 25 ft. Steel or Cast. Complete.
PURIFIERS, Four 10 feet squares, &c., complete.
FOUR-WAY VALVES. Four 8-inch wanted.
State Particulars, Conditions, and Prices on Rail, or as now fixed. Must be cheap.
Address No. 4185, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO BRICK AND CEMENT MAKERS AND OTHERS.

THE Swansea Gaslight Company have FOR SALE good ordinary COKE BREEZE, for shipment, or on rail.
Apply to the MANAGER, Gas-Works, SWANSEA.

SLOUGH GAS AND COKE COMPANY.

THE Directors have the following Plant FOR SALE, owing to the Company's removal to their New Works:—
One 10,000 cubic feet per hour EXHAUSTER.
One 5000 ditto. ditto.
One 5-horse power ENGINE.
One 3 ditto.
The above, which must be moved, can be seen by appointment with Mr. T. C. Webb, Engineer and Manager, Gas-Works, Slough, Bucks.
ARTHUR THOMAS,
Secretary.
High Street, Slough, March 18, 1904.

FOR SALE, a bargain, Exhauster and STEAM-ENGINE combined, by Allen, London, to pass 5000 cubic feet per hour. All Connections complete. May be seen at the Brecon Gas-Works.
For further Particulars, apply to the undersigned.
WM. A. WRIGHT,
Secretary.
Brecon Gas Company,
March 8, 1904.

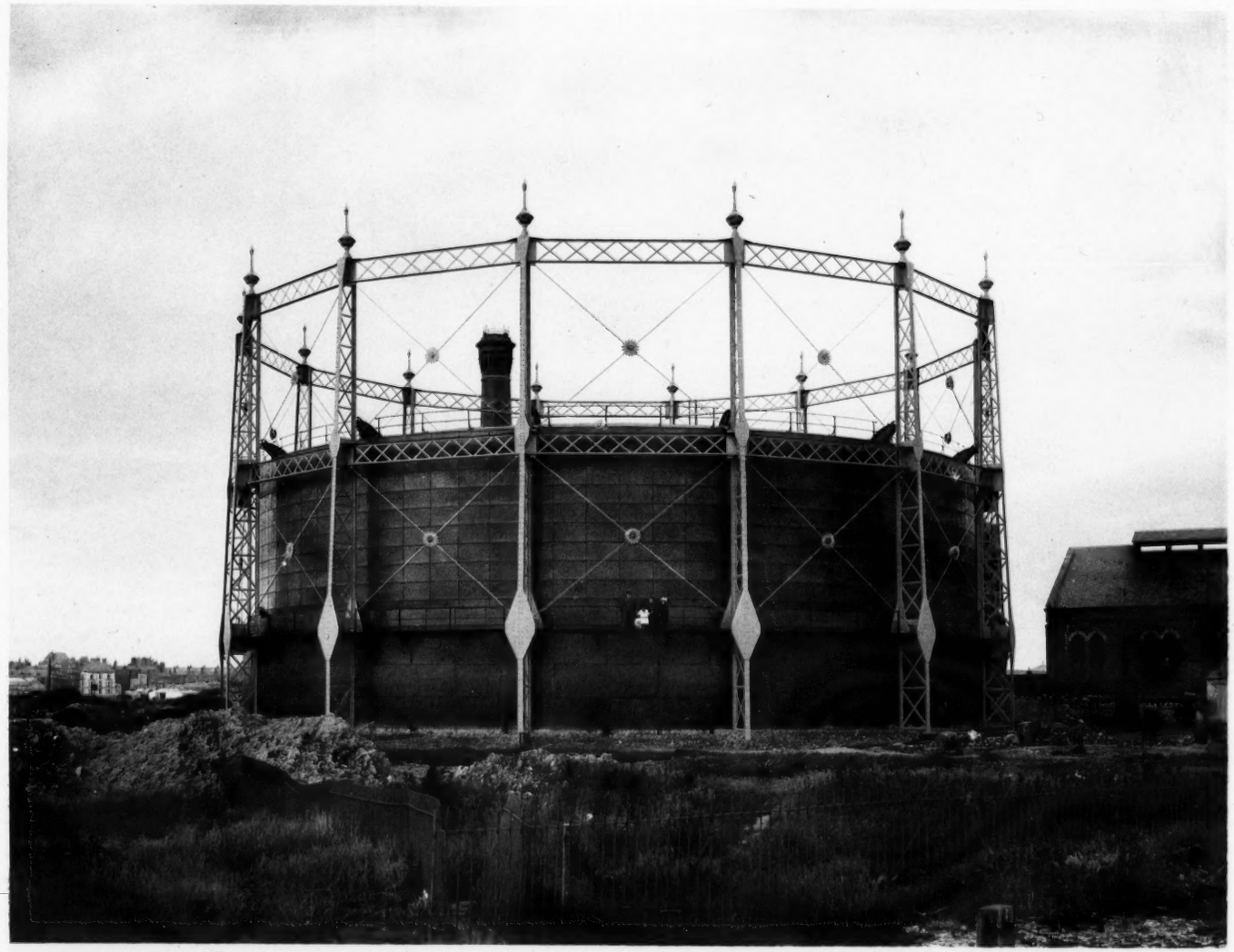
FOR SALE, Cheap, the following good Second-Hand Gas Plant:—
LIVESEY'S PATENT WASHER to pass 250,000 cubic feet per diem. 8-inch Connections.
COCKEY'S PATENT WASHER to pass 100,000 cubic feet per diem. 6-inch Connections.
KIRKHAM'S PATENT WASHER to pass 150,000 cubic feet per diem. 5-inch Connections.
W.I. SCRUBBER, 20 feet high by 3 feet diameter.
Two 8 feet square PURIFIERS, with 8-inch Valves complete.
Also various other GAS PLANT. Inquiries invited.
Apply to SAMUEL WHILE AND SON, 60, Queen Victoria Street, LONDON, E.C.

GOOD GAS PLANT for Sale, Cheap:—
GASHOLDER AND CAST TANK, 40,000 cubic feet capacity, re-fixed cheap; also other sizes.
NEW HOLDERS, STEEL TANKS, made and tendered for.
PURIFIERS—Sets of 4 feet, 5 feet, 6 feet, 8 feet, 10 feet, 12 feet, and 18 feet square. Set of Four PURIFIERS, 21 feet by 28 feet by 6 feet deep.
SCRUBBERS—Single and in pairs, 6 feet by 28 feet, 8 feet by 60 feet, 10 feet by 60 feet.
WASHERS—"Livesey," "Clapham," "Holmes," overhauled.
METERS—Governors up to 18 inches. New Drums.
EXHAUSTERS, ENGINES up to 60,000 cubic feet per hour in Stock.
Buy from the largest Dealers in Second-hand Plant, and who guarantee to leave all Apparatus sold in good working order and satisfactory to the Company.
J. FIRTH BLAKELEY AND CO., Thornhill, DEWSBURY.

RADCLIFFE AND PILKINGTON GAS COMPANY.

PIPES AND SPECIALS.

TENDERS are invited for the supply of 1440 yards of 12-inch Spigot and Socket CAST-IRON GAS-MAINS and a few SPECIALS.
Further Particulars may be obtained from the undersigned, by whom Tenders will be received until Friday, the 1st of April next.
JAMES BRADDOCK,
Manager and Secretary.
Gas-Works, Radcliffe,
March 16, 1904.



Llandudno Urban District Council. T. Davies, Engineer.

TWO-LIFT TELESCOPIC GAS HOLDER IN STEEL TANK. TANK 120'-0" DIA. × 25'-9" DEEP.

MADE AND ERECTED IN 1900, BY

ROBERT DEMPSTER & SONS LTD., ELLAND, YORKS.

Printed for Walter King, by King, Sell & Olding, Ltd.; and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, March 22nd, 1904.

Collotype by Waterlow & Sons Ltd.

FOR SALE—A 40 feet diameter by 14 feet deep Telescopic GASHOLDER. May be inspected at the Worthing Gas-Works.

For Particulars, apply to ROBERT DEMPSTER AND SONS, LIMITED, ELLAND.

CITY OF CARLISLE.

TENDERS FOR GAS OIL.

THE Gas Committee are prepared to receive TENDERS for the supply of about 1000 (One Thousand) Tons of GAS OIL, for the Manufacture of Carburetted Water Gas, during a period of One Year from March 26 next.

Tenders, endorsed "Gas Oil," and addressed to the Chairman of the Gas Committee, to be delivered at the Office of the Town Clerk not later than March 24, 1904.

Forms of Tender and other Particulars on application.

The lowest or any Tender will not necessarily be accepted.

By order,
W. J. SMITH, B.Sc.,
Engineer and General Manager.

Gas-Works, Carlisle,
March 11, 1904.

CITY OF CARLISLE.

TENDERS FOR PURCHASE OF TAR.

THE Gas Committee are prepared to receive TENDERS for the purchase of the surplus Coal and Water Gas TAR, to be produced at their Works for a period of One Year from March 26 next.

Tenders, endorsed "Tar," and addressed to the Chairman of the Gas Committee, to be delivered at the Office of the Town Clerk, not later than March 24, 1904.

Further Particulars may be obtained on application.

The Committee do not bind themselves to accept the highest or any Tender.

By order.
W. J. SMITH, B.Sc.,
Engineer and General Manager.

Gas-Works, Carlisle,
March 11, 1904.

CITY OF CARLISLE.

TENDERS FOR OXIDE OF IRON.

THE Gas Committee are prepared to receive TENDERS for the supply to their Works of about 200 Tons of OXIDE OF IRON. Delivery to be made over a period of One Year from March 26 next.

Tenders, endorsed "Oxide of Iron," to be addressed to the Chairman of the Gas Committee, and delivered at the Office of the Town Clerk, not later than March 24, 1904.

Further Information may be had on application.

No pledge is given for the acceptance of the lowest or any Tender.

By order,
W. J. SMITH, B.Sc.,
Engineer and General Manager.

Gas-Works, Carlisle,
March 11, 1904.

BOROUGH OF CONGLETON.

THE Gas Committee invite Tenders for the supply of best screened GAS COAL or NUTS for Gas-Making purposes, to be delivered in Senders' or Railway Company's Trucks at Brunswick Wharf, Congleton.

Forms of Tender and Conditions may be obtained from the undersigned.

Tenders, endorsed "Gas Fuel," to be delivered at the Office of E. A. Plant, Town Clerk, Congleton, not later than Twelve noon, on Tuesday, April 5, 1904.

The Committee do not bind themselves to accept the lowest or any Tender.

JAMES SMITH,
Engineer and Manager.

Gas-Works, Congleton,
March 15, 1904.

WALLASEY URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

SALE OF WATER-WORKS PUMPING PLANT.

THE Wallasey Urban District Council are prepared to receive OFFERS for the undermentioned WATER-WORKS PUMPING PLANT which they have to dispose of:—

One compound, jet-condensing BEAM ENGINE, with 20-in. high and 30-in. low pressure Cylinders (both 6 ft. stroke), and Lift and Force Pumps, each 18-in. diameter by 6 ft. stroke. This plant has a capacity of 750,000 gallons per twenty-four hours, and was built by Brassey's, Birkenhead, in 1875.

Also one jet-condensing BEAM ENGINE, with 6 ft. stroke, and Lift and Force Pumps, each 18-in. diameter by 6 ft. stroke. This plant was built by Melling in 1860, and has a capacity of 500,000 gallons per twenty-four hours.

Also two-stage AIR-COMPRESSORS, to work up to 150-lbs. air pressure, with two Steam Cylinders each 16-in. diameter and high and low pressure Air Cylinders of 16-in. and 9-in. diameter respectively, and a stroke common to all of 20-in.

The whole of the above-mentioned plant is in first-class running order, and is for sale consequent upon the closing of the Council's Pumping-Station at Poulton-cum-Seacombe.

Permission to view, and all further Particulars may be obtained on application to the Engineer, Mr. J. H. Crowther, at the Gas-Works, Great Float, near Birkenhead.

Offers may be sent in for the whole or any part of the Plant, and must be endorsed, "Tender for Pumping Plant," and delivered per post at my Office as below.

By order,
H. W. COOK,
Clerk and Solicitor.

Public Offices, Egremont,
Cheshire, March 1, 1904.

THE Haworth Urban District Council are prepared to receive TENDERS for the purchase of their surplus TAR and LIQUOR during the Year ending March 31, 1905.

Tenders to be sent in not later than the 24th of March.

WILLIAM ROBERTSHAW,
Clerk.

North Street, Keighley.

COAL TAR.

THE Gas Committee of the Belfast City Council invite TENDERS for the Purchase of the surplus COAL TAR made at their Works, for a term of Three, Five, or Seven Years, commencing on the 1st of July, 1904.

The present annual make of Coal Tar is about 1,000,000 Gallons.

Conditions of Contract and other Particulars may be obtained from the Manager of the Gas-Works.

Tenders, on Office Forms, must be delivered on or before April 14, addressed to Sir Samuel Black, Town Clerk, Belfast, and endorsed "Tender for Coal Tar."

The Committee may not accept the highest or any Tender.

JAMES STELFOX,
Engineer and Manager.

Belfast Corporation Gas-Works,
March 17, 1904.

CARBURETTED WATER-GAS TAR.

THE Gas Committee of the Belfast City Council invite TENDERS for the purchase of the surplus CARBURETTED WATER-GAS TAR made at their Works, for a term of Three, Five, or Seven Years, commencing on July 1, 1904.

The present annual make of Carburetted Water Gas Tar is estimated at about 350,000 Gallons.

Conditions of Contract and other Particulars may be obtained from the Manager of the Gas-Works.

Tenders, on Office Forms, must be delivered on or before April 14, addressed to Sir Samuel Black, Town Clerk, Belfast, and endorsed "Tender for Carburetted Water-Gas Tar."

The Committee may not accept the highest or any Tender.

JAMES STELFOX,
Engineer and Manager.

Belfast Corporation Gas-Works,
March 17, 1904.

AMMONIACAL LIQUOR.

THE Gas Committee of the Belfast City Council invite TENDERS for the purchase of the AMMONIACAL LIQUOR made at their Works for a term of Three, Five, or Seven Years, commencing on July 1, 1904.

The present annual make of Liquor is equal to about 3½ Million Gallons, as of 4° Twaddel; but the strength at which it is usually supplied is from 5° to 7° Twaddel.

Conditions of Contract and other Particulars may be obtained from the Manager of the Gas-Works.

Tenders, on Office Forms, must be delivered on or before April 14, addressed to Sir Samuel Black, Town Clerk, Belfast, and endorsed "Tender for Ammoniacal Liquor."

The Committee may not accept the highest or any Tender.

JAMES STELFOX,
Engineer and Manager.

Belfast Corporation Gas-Works,
March 17, 1904.

COMMERCIAL GAS COMPANY.

TENDERS FOR COAL.

THE Directors are prepared to receive TENDERS for the supply of 220,000 Tons of clean, dry, unscreened, fresh-wrought GAS COALS, delivered f.o.b. to the Company's Steamers at any suitable Port, during the Year ending the 30th of April, 1905.

The deliveries to be in about equal monthly quantities throughout the Year.

Payment in cash monthly.

Parties desiring to Tender for more than One Year must state separately the price and quantity offered for each Year.

Particulars and Forms of Contract may be obtained from the Engineer, Mr. S. H. Jones.

The Directors do not bind themselves to accept the lowest or any Tender.

Tenders, sealed and endorsed "Tender for Coals," to be addressed to the Chairman of the Coal Committee, and delivered at the Company's Offices not later than Nine o'clock on the 30th inst.

Commercial Gas-Works,
Stepney, E., March 17, 1904.

WALLASEY URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

TO ENGINEERS, RAILWAY CONTRACTORS, AND OTHERS.
CONSTRUCTION OF BRANCH RAILWAY.

THE Wallasey Urban District Council are prepared to receive TENDERS for the Construction of a BRANCH RAILWAY to their Gas-Works, including WEIGHBRIDGE and Office, Cart Road, and Alterations to existing Railway on the Works.

Plans may be seen at the Office of the Engineer, Mr. J. H. Crowther, at the said Works, and copies of the Specification can also be obtained, on payment of £3 3s., which amount will be returned on receipt by the Council of a *bonâ-fide* Tender.

Sealed Tenders, on the Form embodied in the Specification, addressed to the undersigned, and endorsed "Tender for Branch Railway to Gas-Works," to be delivered per post at my Office not later than the Morning of the 20th of April, 1904.

The Contractor will be required to enter into a bond, with approved sureties, for the due fulfilment of the Contract.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
H. W. COOK,
Clerk and Solicitor.

Public Offices, Egremont,
Cheshire, March 16, 1904.

THE STIRLING BOILER.

WARNING.

THE Stirling Company (who are the original makers of the STIRLING BOILER) HEREBY GIVE NOTICE, that they have commenced proceedings for infringement of their Patent, No. 20,404 of the Year 1895, against the Stirling Boiler Company, Limited, of Edinburgh, in respect of their Five-Drum Boilers.

ALL PURCHASERS of such Five-Drum Boilers from the Stirling Boiler Company, Limited, ARE HEREBY NOTIFIED that such proceedings have been commenced, and that USERS ARE LIABLE as well as Manufacturers, and that the Stirling Company intend to enforce their rights against all infringers.

Dated this 11th day of March, 1904,
For THE STIRLING COMPANY,
E. G. CONSTANTINE,
Manager, British Branch,
53, Deansgate Arcade, MANCHESTER.

GLASGOW CORPORATION.
(GAS DEPARTMENT.)

THE Corporation invite Tenders for Providing and Erecting BENZOL and CARBOLIC ACID PLANT required in connection with their New Provan Chemical Works.

The Drawings may be seen, and Copies of the Specification and Form of Tender obtained, on application to Mr. A. Wilson, the Engineer, at his Office, 45, John Street, Glasgow.

Tenders, endorsed "Gas Department: Benzol and Carbolic Plant for Provan Chemical Works," must be lodged with the Subscriber on or before Tuesday, the 29th inst.

The Corporation do not bind themselves to accept the lowest or other Tender.

JAMES G. MONRO,
Town Clerk.

City Chambers, Glasgow,
March 14, 1904.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 30th inst., at Twelve o'clock precisely, to transact the usual Business, and to declare a Dividend for the Half Year ended the 31st of December last.

Notice is Hereby also Given, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 19th and RE-OPENED on the 31st inst.

By order of the Court of Directors,
H. B. CHAMBERLAIN,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
March 9, 1904.

TAR Contracts Wanted on the Sliding Scale or at Fixed Prices.

Managers and Secretaries desirous of selling to best advantage please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
HASTINGS AND ST. LEONARDS GAS COMPANY.

NEW ISSUE OF £10,000 ADDITIONAL FIVE PER CENT. ORDINARY STOCK

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 12, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

CASES FOR BINDING
QUARTERLY
VOLUMES OF THE "JOURNAL."
GREEN CLOTH, GILT LETTERED.

DOVER, The Ancient Cinque Port:
Reminiscences of an Ancient Freeman.
JUST PUBLISHED.
Revised Edition, enlarged to 68 pages, bound in blue cloth, gilt lettered.
PRICE - - - 1s.
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TEMPLE HOUSE, TEMPLE AVENUE,
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SAVE MONEY LABOUR

Imperial Cookers give no trouble, and for quality and cheapness cannot be excelled.

TWO GOLD MEDALS in Six Months.

Our Gas-Cooker Orders last Year were

455 % (per cent.)

more than in 1902.

THE IMPERIAL STOVE CO., LEAMINGTON SPA.

Telegrams: "Imperial, Leamington."
Telephone: One X.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to **Mr. EDWARD PRICE,** "Langley," Wyke Avenue, **WORTHING.**

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

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SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
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ANVILS, VICES,
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New and Second-Hand with all Accessories; also Tip Waggons and Turntables.

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CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

THE
PETROLEUM GAS SYNDICATE

Supply and erect Complete Installations of their

PETROGENE PATENT GAS PLANT
On SALE, HIRE, or ROYALTY.

PETROGENE GAS is the most suitable Illuminant for all Towns, Villages, Factories, Institutions, &c., where a Cheap and Efficient Lighting System is required. It is equally suitable for Heating and Power purposes, and may be used with ordinary Gas Fittings, Stoves, Engines, &c. It may also be used in conjunction with Coal Gas, and affords Gas Companies a ready means of increasing their output without the expense of additional storage.

The Syndicate is prepared to entertain offers of sale of small Gas-Works, whether profit earning or not.

Offices: **28, Victoria St., Westminster.**
Works: **10, Rochester Row, S.W.**

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"BRITON"
and RENNIE
Gas Arc Lamps
(COLBRAN'S PATENT).

VERY STRONG AND ORNAMENTAL LAMPS.

REGISTERED.
"V" PATTERN "BRITON" LAMP.

JOHN F. COLBRAN,
THE CROWN LAMP WORKS,
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Telephone: No. 4199 Central.

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GAS AND CANNEL COAL MERCHANT,
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Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
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Rich in Illuminating Power and yield of Gas
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

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THE
"ROTARY"
STATION METER.

Efficiency Demonstrated.

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ALFRETON IRON-WORKS, DERBYSHIRE,
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Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

WELDON MUD
FOR
GAS PURIFICATION,

For use in the
RECOVERY OF SULPHUR,
Also Removal of last Traces of
SULPHURETTED HYDROGEN
in catch position.

Full Particulars on application to the Patentees
GAS DESULPHURIZATION CO.,
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TROTTER, HAINES, & CORBETT, LIMITED,
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FIRE-CLAY & BRICK WORKS,
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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.
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COKE-BREAKERS,
PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT)
With Elevators and Conveyors worked by Steam or Gas Engine.
GEORGE WALLER & SON,
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THE PERFECT MANTLE COY.,
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MANUFACTURERS OF THE WELL-KNOWN
SUPERIOR "PERMCO"
MANTLE, IN COTTON AND RAMIE.

Under Welsbach Licence. Can be used legally with any Burner.
Trade Price 26s. 6d. per Gross.
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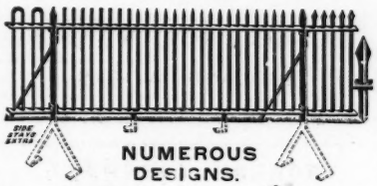
LIMITED,
Manufacturers of
IRON RAILING &c.



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LISTS FREE.
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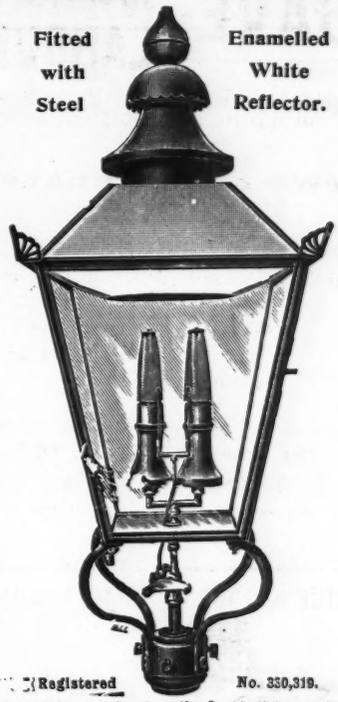
THE
"KILBURN" LANTERN.
Fitted with Steel
Enamelled White Reflector.



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H. GREENE & SONS, Limited,
Surrey Engineering Works,
Blackfriars Road, LONDON.
Telephone 1698 HOP.
Telegrams: "LUMINOSITY LONDON."

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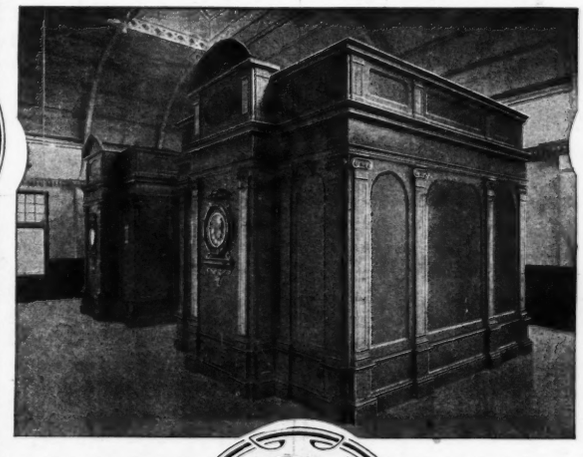
GAS & WATER ENGINEERS,



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TWO STATION METERS EACH TO PASS 200000 CUB.FT PER HOUR. ERECTED AT THE GRANTON GAS WORKS FOR THE EDINBURGH & LEITH GAS COMMISSIONERS.

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FOR

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AN IDEAL LAMP FOR INTERIOR LIGHTING.

The Smartest Imitation of the Electric Arc ever placed on the Market.

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GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas and Other Purposes.

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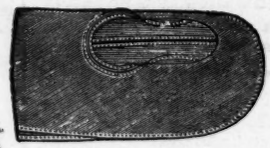
THOMAS BUGDEN, MANUFACTURER OF

TAR and LIQUOR HOSE, and Special AIR TUBING.



BELLOWS made to inflate a 48-inch Bag under One Minute. Various sizes made.

STOKERS' MITTS. Made from best Tanned Leather.

India-rubber Goods of every description. Leather Bands Oils, &c., Diving and Wading Dresses, Waterproof Coats and Capes, Sewer Boots, and Theatrical Air-Proof Dresses.

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Best Materials and Workmanship Guaranteed.

Miners' Woollen Jackets (Also made in Blue Serge.) No. 1, 12/- each; No. 2, 9/6.

Gas-Bags for Mains All Seams Stitched and Taped.

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Patent Automatic Machinery

FOR

DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers.

SIR WILLIAM ARROL & CO., Limited,

GLASGOW.

[See Illustrated Advertisement, March 1, p. 510.]

STARTLING INVENTION!

Carborundum Bricks, Carborundum Crucibles, &c.

DR. ENGELS' PATENT

CARBORUNDUM COATINGS

For Lining **GAS-GENERATORS.**

For Lining and Repairing **GAS-RETORTS.**

For Metallurgical and Chemical purposes, Furnaces, and Firing Plants of all kinds.

The Fire-Proof Products Co., Ld.

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THE STAFFORDSHIRE TUBE CO. LTD.

AND FITTINGS

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Proprietors of

ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·20.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS, SHEFFIELD."

'STANDARD' PURIFYING GRIDS.

(F. D. MARSHALL'S PATENT.)

A NEW DEPARTURE IN GRIDS.

Increase the effective working capacity of the purifiers by 100 per cent.

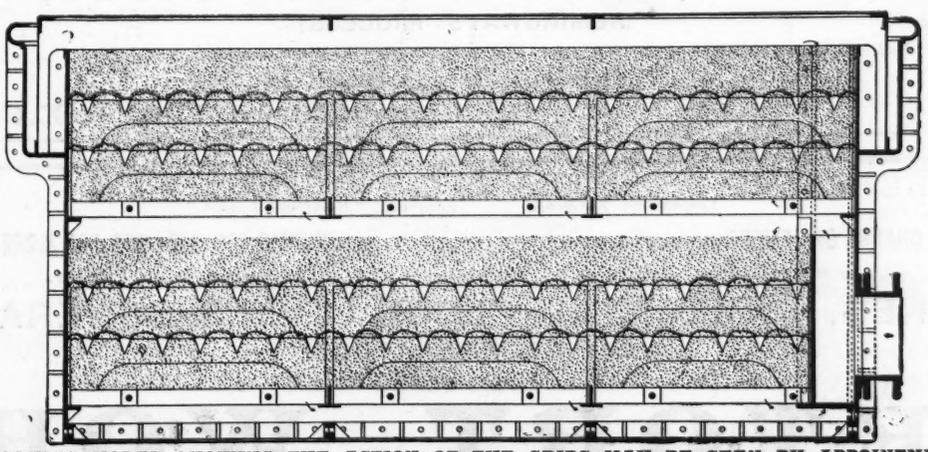
Decrease the velocity of the gas by 50 per cent.

Decrease the Back-pressure by 50 per cent.

Decrease the cost of filling and emptying Purifiers and cleaning Grids by 30 per cent.

RESULTS GUARANTEED.

Can be fitted to any existing Purifiers without disturbance.



SUPERIOR to any other known form of Grids, British or Foreign.

A WORKING MODEL SHOWING THE ACTION OF THE GRIDS MAY BE SEEN BY APPOINTMENT.

The "STANDARD" GRIDS are in use at the following Continental Gas-Works: Berlin (Gitschinerstrasse Works), Zurich, Cologne, Stuttgart, Frankfort, Baden, Münster, Ludwigshafen, Bamberg, Lichtenberg, Kiel, Salzwedel, Braunsweig, Schawb, Freiberg, Quedlinburg, Zehdenick, Neumünster, Braunsberg, Breslau, &c.

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KIRKHAM, HULETT, & CHANDLER, LD.,

PALACE CHAMBERS, BRIDGE ST., WESTMINSTER, S.W.

Telegraphic Address: "WASHER, LONDON."

Telephone: No. 127 Victoria.

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Absolutely Wind Proof.

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Most Powerful and Reliable.

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A New Device which abolishes Levers and Chains.

THE "WIS" SHADE LIGHT

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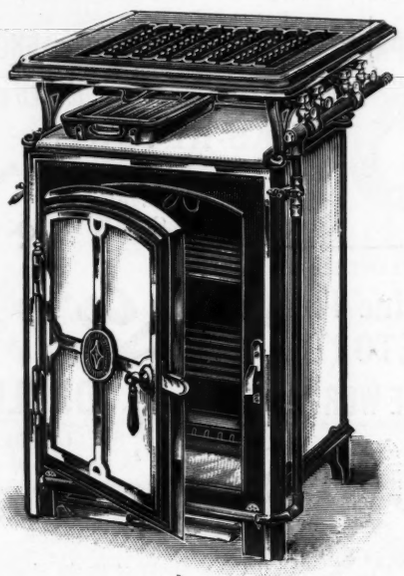

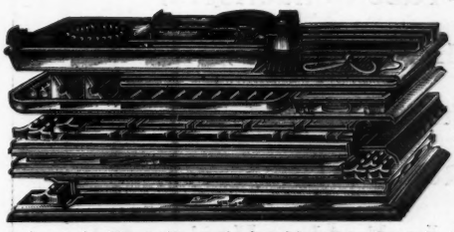

This cut shows the No. 3 size ready for shipment. It packs in a case measuring 32 in. by 24 in. by 18 in. = 8 cubic feet. Other sizes in proportion. In packing quantities a still further reduction will be effected.

DIMENSIONS.	INSIDE.				OUTSIDE.			
	No.	High.	Wide.	Deep.	No.	High.	Wide.	Deep.
	1	—	12 in.	12 in.	1	—	—	—
	2	25½ in.	14 in.	12 in.	2	33½ in.	22½ in.	17½ in.
	3	26½ in.	15 in.	14 in.	3	34½ in.	23½ in.	19½ in.
	4	27¾ in.	16 in.	16 in.	4	36 in.	27¼ in.	25 in.
	5	27¾ in.	17 in.	17 in.	5	36 in.	29¼ in.	26 in.

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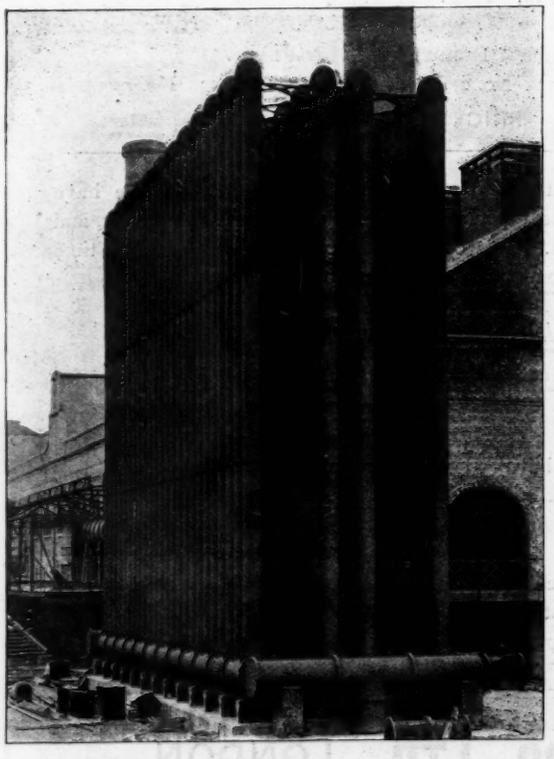

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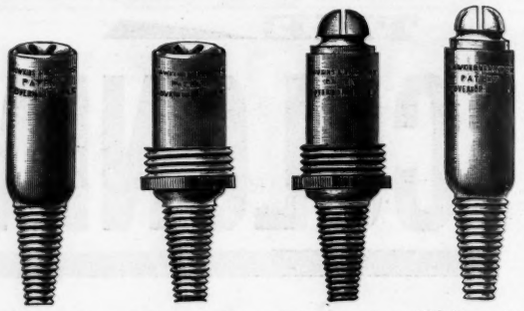

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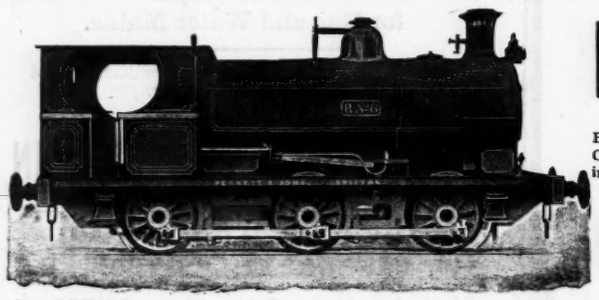

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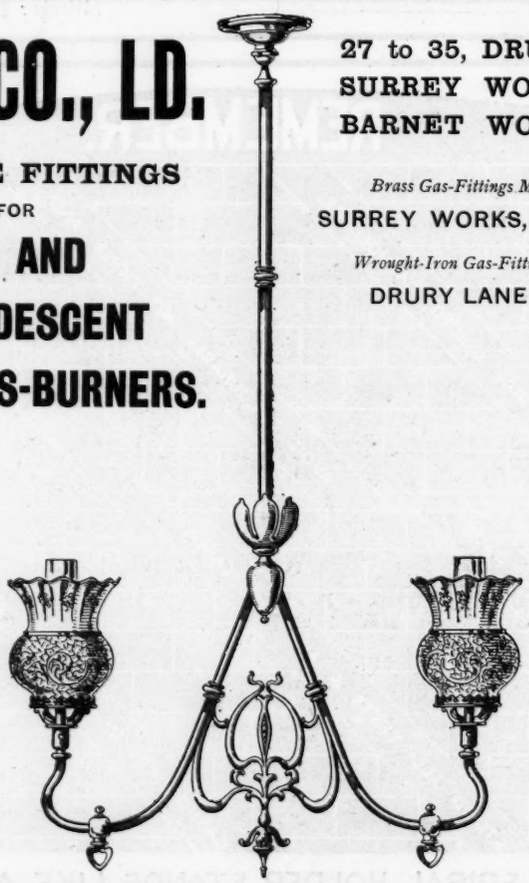

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